Science & Mechanics

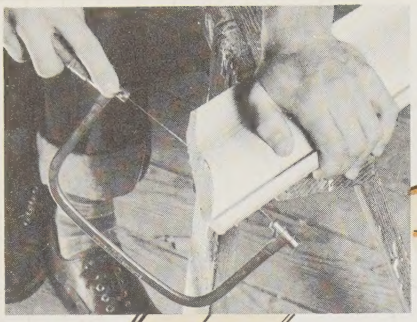
Complete HANDYMAN ENCYCLOPEDIA

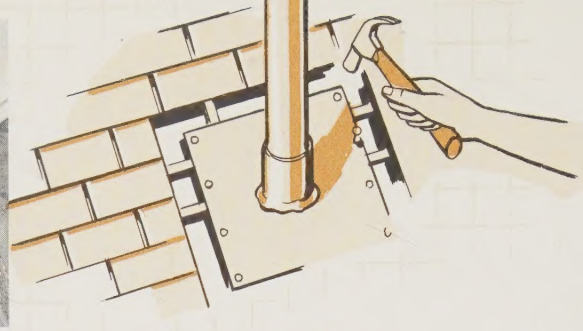
do-it-yourself

12

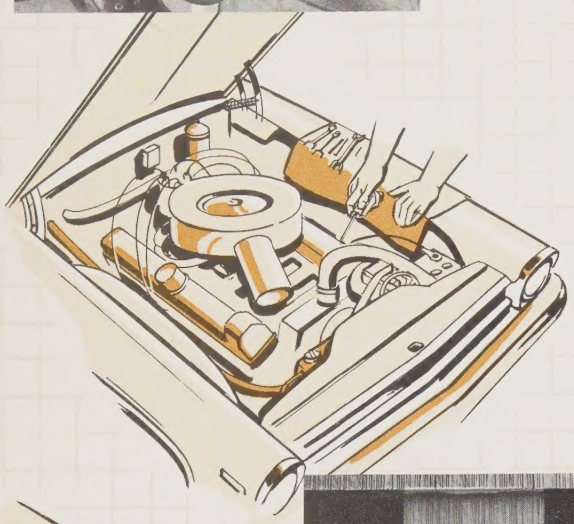
MOLDINGS
PAINT SPRAYERS

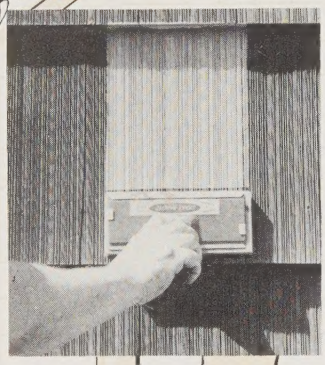
Complete Handyman do-it-yourself Encyclopedia



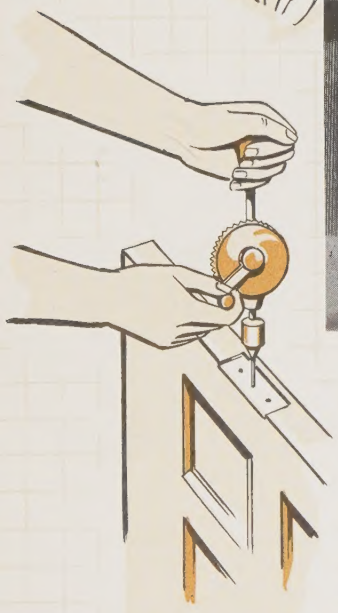


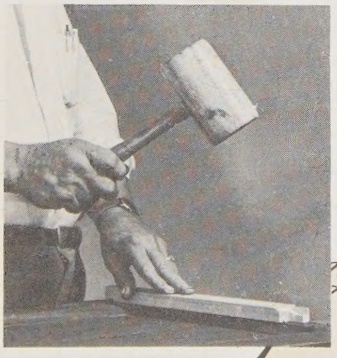
do-it-





- Home Modernizing
- Home Repair and Improvement
- Auto Repair and Maintenance
- Appliance Repair
- Furniture Building
- Interior Home Projects
- Exterior Craft Projects
- Gardening
- Use of Hand and Power Tools
- Boat Building
- Boat Handling
- Fishing and Fishing Equipment
- Hunting and Hunting Equipment
- Camping and Camping Equipment
- Hobbies and Crafts
- Radio, TV and Electronics
- Electrical Installation





Complete Handyman yourself Encyclopedia

A COMPILATION OF SPECIAL INTEREST PROJECTS AND MANUALS FOR THE REPAIR AND CARE OF HOMES, AUTOS, APPLIANCES, HOBBY EQUIPMENT.

by the editors of

Science & Mechanics

12

MOLDINGS

PAINT SPRAYERS

H. S. STUTTMAN CO., INC. *publishers* New York, N.Y. 10016

COPYRIGHT © 1975 BY
H. S. STUTTMAN CO., INC.

ISBN 0-87475
Library of Congress Catalog Card No. 74-21375

No part of the text or illustrations in this compilation may be reproduced without written permission. Manuscripts were produced by DAVIS PUBLICATIONS, INC.

All instructions and diagrams have been checked for accuracy. However, success and safety in working with tools depend on individual accuracy, care, caution and skill. For this reason, the authors and publishers cannot guarantee the result of any project, nor assume responsibility for damage to property or injury to persons. In using any tools, building any projects, or carrying out any procedures, persons do so entirely at their own risk.

PRINTED IN THE UNITED STATES OF AMERICA

2P-2599-20(40)

VOLUME 12

MOLDINGS

WHAT YOU CAN DO WITH MOLDINGS: These milled strips of wood come in a variety of shapes and sizes. You can use them to harmonize a design, decorate a too-plain surface, smooth an awkward angle or hide an open joint.....1701

NAILS

ALL ABOUT NAILS AND NAILING: How to choose and drive nails, including curved nailing and blind nailing 1707

NAVIGATION

BOATING'S "RULES OF THE ROAD": The basics—the ones that prevent collisions—are simple, and they can save your life and property. Start there and progress to the finer points, such as reading harbor lights, so you can increase the usefulness of your boat.....1711

THE SIMPLE WAY TO STEER BY COMPASS: Using a compass to navigate from one point to another is a lot easier than some experts make it sound. Here's how to do it, as well as how to install a compass in your boat and how to adjust it.....1722

ALL ABOUT FOLK NAVIGATION: When charts and instruments won't tell you everything, use these old-timer's tricks to read the bank and the water surface to find out what the bottom is like.....1730

NOISE

NOISE AND YOUR HOMESITE: The screech of a landing jet or the roar of a truck climbing a hill can destroy your tranquility, disrupt your sleep and depress the value of your property. Use these guides to evaluate the environment for noise pollution before you build or buy 1734

OIL, ENGINE

HOW TO STOP ENGINE OIL LOSS: Before you start thinking about an expensive replacement of piston rings, take a look at the many other factors that cause your car's engine to lose oil 1743

ORGANIC GARDENING

ALL ABOUT ORGANIC GARDENING: How to improve your garden's health by using little or no chemical fertilizer or insecticide.....1748

ORNAMENTS, LAWN

DECORATE YOUR LAWN WITH A WISHING WELL: This attractive piece will add interest to your lawn as well as a shady spot to rest or use as an outdoor buffet.....1759

CASTING YOUR OWN LAWN BIRDBATH: Be creative and design your own, or follow the suggested forms here, to make an attractive lawn ornament.....1763

ADD A RESTFUL AIR TO YOUR YARD: Precast concrete lawn benches are available, but casting your own bench has the advantages of suiting your tastes and saving money.....1764

BUILD A LAMPPOST FOR YOUR FRONT YARD: Accessories add beauty to your front lawn. This easy-to-build lamppost will illuminate your entryway and carry numbers for easy identification of your address.....1765

OUTBOARD MOTORS

CHOOSING AN OUTBOARD MOTOR: The wide variety of horsepower ratings of the power plants require you to analyze your needs before you buy.....1770

MAINTAINING YOUR OUTBOARD MOTOR: Keeping your outboard motor in good shape will increase its useful life and improve the performance of your boat.....1772

MOTORIZE YOUR CANOE: It takes about an hour to build this sturdy mount for a small outboard motor.....1777

OUTDOOR COOKING

COOKING CONVENIENCE AT THE CAMPSITE: This easily built chuck box will put all your cooking near at hand and remove much drudgery from camp cooking.....1780

PORTABLE FLAMELESS COOKER: For camper, trailer, boat or cabin, this table top version of the old bean hole oven will add a note of convenience to any outdoor trip.....1782

IMPROVISING COOKING RIGS AT THE CAMPSITE: You can assemble these makeshift appliances from anything you have lying around at almost no cost whatsoever.....1784

OUTDOOR LIFE

LIVING OFF THE LAND: With a few manuals and some basic information, you are well on your way to reaping in the bonanza of food surrounding you in the wilderness.....1787

CAMPSITE COOKING WITH FOIL: While many ardent camp cooks frown on the use of foil, it is lighter in your pack than dozens of utensils, it is disposable, and most important, it is highly versatile.....1792

OVENS

A LIGHTWEIGHT BACK PACK OVEN YOU CAN MAKE: Most manufactured reflector ovens are too heavy for back packers, so if you are fussy about the weight of your pack, this no-cost four ounce handmade oven is ideal.....1798

PADDLE WHEELER

BUILD A POGO STERN WHEELER: This is not a deep-sea boat, but with its shallow draft and weed-proof propulsion system it's just right for exploring coves and bayous.....1800

PAINT

HOW TO ESTIMATE PAINT REQUIREMENTS: An accurate estimate can save you dollars and ensure enough paint to get the job done.....1806

PAINT WITH BRUSHES, PADS OR ROLLERS: No matter what you want to paint, there is equipment designed to do the job. Use this guide to select the painting tools that meet your requirements.....1807

PAINTING

HOW TO PREPARE SURFACES FOR PAINTING: Here's what to do when the surface you want to repaint is rough, cracked, peeled or blistered.....1813

PAINT WOOD OR FABRIC WITH DYES: Widely available inexpensive dyes can be used to create interesting effects on table tops, drapes, or wherever your imagination leads you.....1815

MAKE A MARBLE TABLE TOP OUT OF PLYWOOD: You can marbleize plywood, or any other smooth paintable surface, with a special kit or with fast drying enamels.....1816

PAINTING, AUTO

PAINT YOUR CAR LIKE A PRO: Rent the tools, buy the paint and make your car look like new again—at a substantial saving.....1819

PAINTING, HOUSE

PAINTING PROBLEMS AND HOW TO SOLVE THEM: Use these tips to overcome the most common difficulties encountered in house painting.....1827

ALL ABOUT EXTERIOR HOUSE PAINTING: Painting your house yourself is a major project, but it can yield substantial savings. Here's what you need to know to plan the job, buy the materials and apply the paint.....1832

ALL ABOUT PAINTING YOUR HOME'S INTERIOR: You can brighten up a dull room with a crisp new coat of paint. Here's how to do the job quickly and easily.....1845

PAINT SPRAYERS

SPRAY PAINTING WITH AN AEROSOL CAN:.....1854

What You Can Do with Moldings

These milled strips of wood come in a variety of shapes and sizes. You can use them to harmonize a design, decorate a too-plain surface, smooth an awkward angle or hide an open joint

In small panels, fit the moldings and drive into place, tapping lightly and moving around the assembly until the pieces are seated.

MOLDINGS ARE the buttons and bows of joinery. They accent and decorate otherwise too-plain surfaces while harmonizing design and structure. A boon to the woodworker, they smooth awkward angles and hide open joints.

They're easy to get, too. Local lumber yards stock a variety of patterns useful for carpentry and plain furniture, while craftsman's supply houses sell gracefully profiled hardwood moldings, many embossed with attractive designs in imitation of carving. Art stores carry handsome prefinished moldings especially for making picture frames.

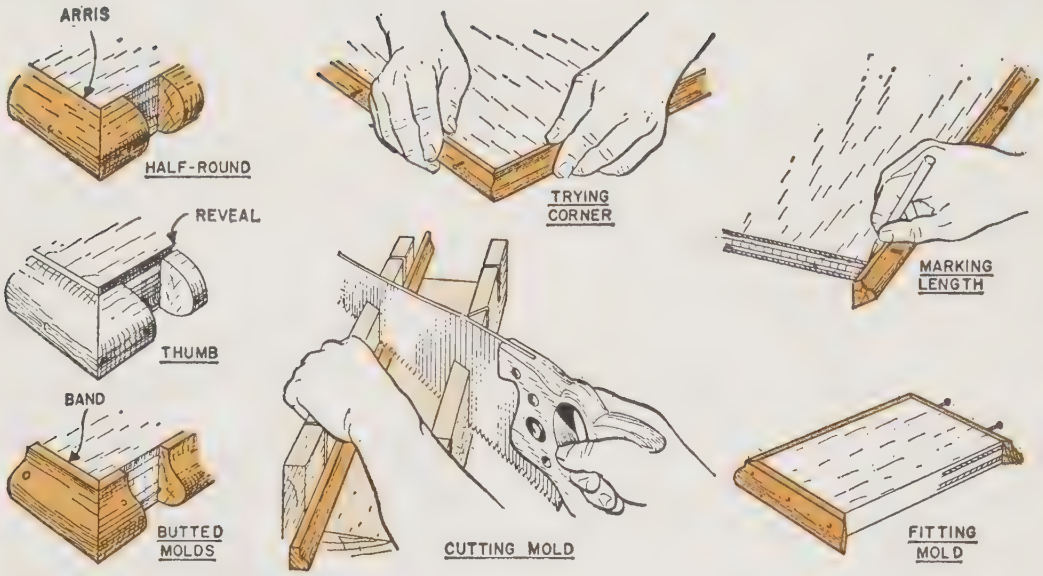
Moldings can be attached by nails, screws, or glue, depending on the desired appearance of the completed project and the type of finish to be used. Regular shop tools such as hammer, screwdriver, miter box, a brace and bits, coping saw and a fine crosscut saw are all of the equipment necessary for working with moldings.

Edge moldings. Use along the outside of a plywood table or tray. Besides giving a professional touch of ornament, it will hide the edge grain, increase the apparent thickness, or serve as a railing. The use of moldings with plywood is especially successful as there is little of the shrinkage or swelling that disturbs mitered moldings applied to solid lumber.

A wide variety of effects can be obtained when applying butted molding. Among these, half-round moldings fitted flush with the surface give the effect of a mitered arris while the thumb molding, set down $\frac{1}{16}$ to $\frac{1}{8}$-inch, attracts interest by the angle formed in the profile. A molding having a flat edge and applied flush will form a band of somewhat differently grained wood.

To fit and attach edge moldings to rectangular work such as tables or trays, first cut the four pieces to length, allowing enough stock for the mitered corners. Then cut the mating ends of the first two pieces

mosaics: see handicrafts
motorized surfboard: see runabouts
motor, outboard: see outboard motors
muffler: see engine
multi-sided columns: see hoppers



To miter a molding, hold it upside down in the miter box, being sure the flats at the back make contact with the bottom and side of the miter box.

to match in the miter box. While holding these pieces in position on the work, temporarily attach the first molding with partly-driven brads.

After fitting the joint by trimming as necessary with a block plane, mark the length of the first piece. Remove it, and cut the miters for the joint between the first and third pieces. Fit these in the same way and then permanently attach the first piece, temporarily tacking the second and third in place while you fit the fourth. Be sure the fourth or final piece is cut oversize to allow trimming to fit. In rare cases where this is not possible, the adjacent edges of the table or tray can be dressed down to permit fitting of the molding.

Reveal molding. To keep nails from being deflected by hard-grained moldings, clip off the points before driving. When setting the molding below the top of the work to show a reveal, use a marking gauge to draw a line around the edge as a guide. If glue is used, apply it to both joining surfaces and wipe off the squeezed-out excess. Glue is of little use in miters unless the end grain is sized first with thin glue, allowed to dry, scraped smooth, and then coated with standard glue.

If glue alone is used to hold the moldings, as when a transparent finish is intended, rabbeting of the molding or work

—or the use of a slip tongue—is advisable. These methods afford positive alignment and increase gluing area. Fit the joints as described for nailed moldings. A circular saw setup for grooving strip moldings uses a wooden spring clamped to the rip-fence to hold the strip against the dado blades. The hand-held push stick forces the molding against the fence.

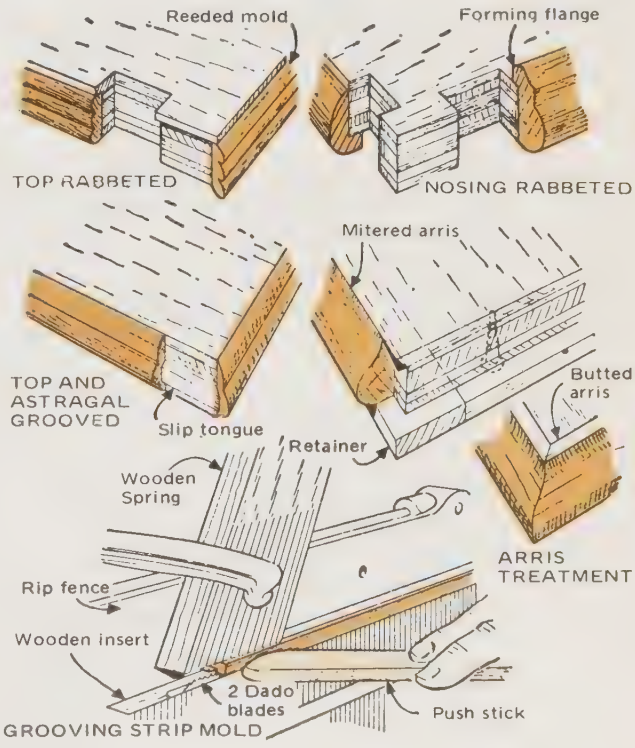
Also for transparent finishes, you may wish to miter the arrises to avoid the appearance of a flat border of wood around a table top. One method is to miter the upper edges of the molding and rabbet the edge of the work, using square-edged cutters and tilting the arbor to miter the rabbet flange. Screw a retaining strip to the underside of the work to force the parts together at the mitered arrises and hold the molding in place with clamps until the glue is dry. The retainers can then be removed if desired.

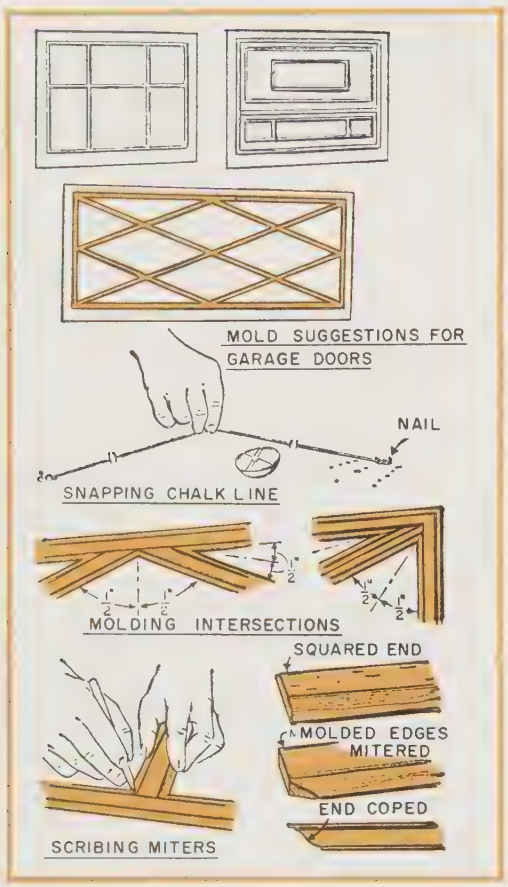
Decorative moldings. Miter moldings can be added to flat surfaces such as plywood-faced garage doors with striking effect. If the walls of a house are cut up with many doors and windows, the broad expanse of a plain-surfaced garage door can be distracting. Break it up into rectangles, vertical or horizontal, according to the trend of the house. Diamonds are acceptable with gabled roofs.

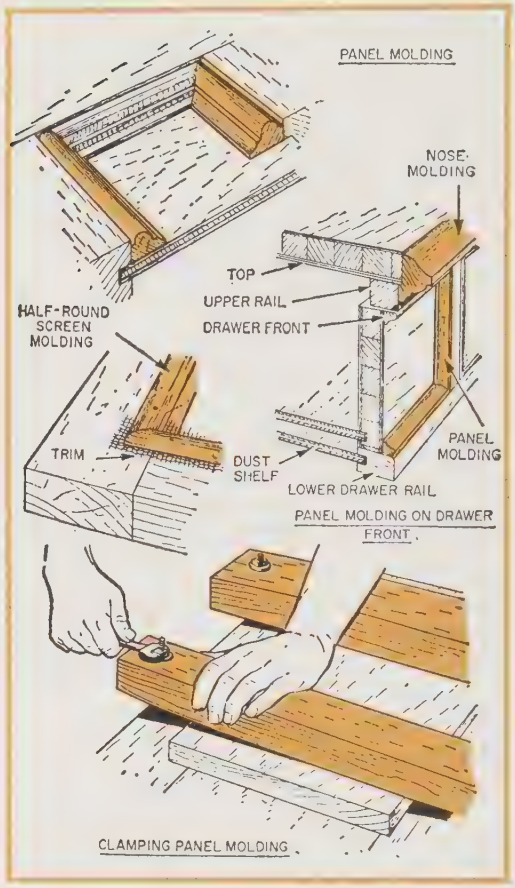
The layout is most important and the observation of a simple rule or two goes far to make it correct. An odd number of vertical panels is usually better than an even number and the effect still more interesting if they are varied in size with the center panel of three a little larger than the others. If the door is to be divided horizontally, put the division below or above center. As for the moldings, flat bands, plain flutes, reeds, half-rounds, beveled sections, and astragals are all acceptable.

Lay out guides by snapping chalk lines or by the use of straightedge and pencil. Most of the joints will be mitered. A batten molding having a flat band with an ogee at each edge can be mitered at outside corners but otherwise is butted at the center section with only mold edges mitered. If there are several right-angle joints inside, make a marking template from scrap by coping the end to fit over the molded edge of the band it is to be butted against. Trace the edge of the miter with a scriber, saw along the lines, and chisel out the notch. Then miter the edges of the joining pieces to fit. Notice that the angle of cut in all miters, whether regular or odd, are half the total angle.

Cut the pieces and tack them in place, fitting the joints as you go. Then remove them, piece by piece, coat the cut ends and backs of the moldings with paint or, for stained or natural finishes, with clear sealer. Give the same treatment to the plywood backing. When construction is done, work the finish in along the edges with a brush







to seal the joints, preventing water from soaking in to encourage decay or lift the molding during freezing.

Never attach molding across the grain of siding or other solid boards as the continual shrinking and swelling will soon loosen the molding.

Surface moldings. These are used on window screens for holding the wire in place. Half-round screen molding is first mitered and one strip is nailed along one rail over the end of the screen. After the screen is stretched, the mold at the opposite end is placed. Trim the projecting screen edges with the corner of the chisel. Backpaint screen molds to lessen the soaking in of rain water.

One molding job often encountered by the home carpenter is to renew cap and base molds around square porch columns and pilasters. Shrinkage of a new column usually opens up molding joints but, after some seasons, the wood gets a set and there is less movement. Consequently, the second application of moldings is likely to be better and more permanent than the first.

Scrape off all loose paint and, if the post sides bulge, work them down flat. If the base block follows the drainage slope of the floor, the moldings on these sides will slope also. When mitering the ends, block up the pieces correspondingly in the miter box.

Panel moldings. In panel-molding work the trick is to seat the pieces in position

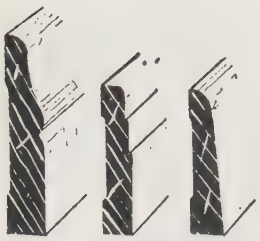
with light mallet blows, working around and around until all are seated. The moldings may project above the frame or lie below the surface according to the design. If the panels are plywood, apply glue to the panel, frame edges and to the bottom and backs of the moldings. If the panels are of solid wood, however, glue only the edges.

Plain paneled front doors can be made more attractive with paneled moldings. For paint work they can be nailed, but for transparent finishes, use glue. In protected outdoor sites, a water-resistant glue of the urea type is satisfactory. If subject to wetting, use a phenolic glue.

Sunken drawer fronts typical of much Spanish furniture result from borders of panel molds glued to the surfaces. Slipping of the pieces when being clamped can be avoided by driving two or three brads into the backs of the moldings, clipping off the heads, and filing points on the nails. A profile of the kind shown with a sunken fillet and roll helps disguise the joint between the drawer front and the surrounding frame. Border cabinet doors in the same way.

Clamps for gluing panel molds can be made from pieces of 2x3-inch stock tapered ⅛-inch toward each end and linked together at the ends with ¼-inch carriage bolts. The bolts, when tightened, apply pressure on the moldings. Use boards or strips under the clamps to distribute the pressure.

Crown moldings. The finishing touch on many tall cabinets and clocks is a molding around the top forming a cap, fittingly called a crown molding. Backing cleats are screwed to the cabinet and the molding is secured with screws through the cleats. Counterbore the holes to sink the heads


BASE

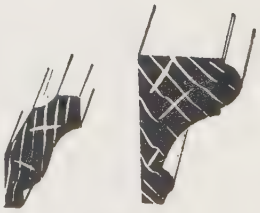
BASE

CASINGS

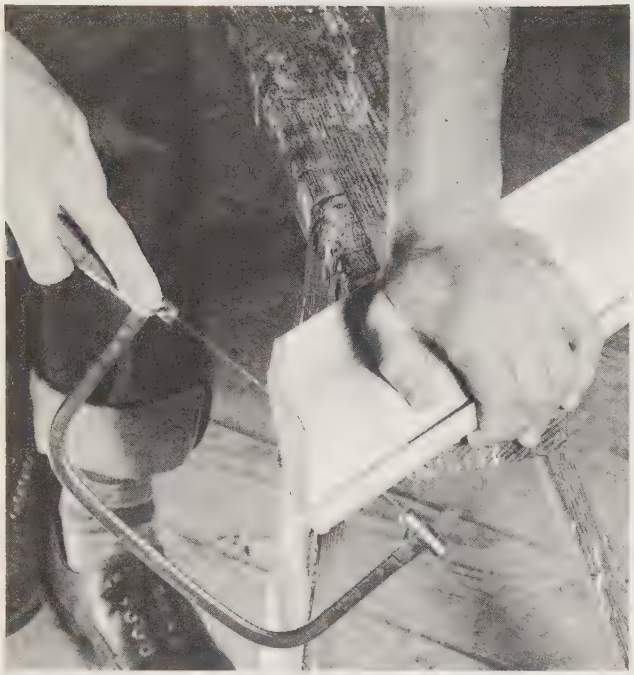
QUARTER ROUND

BASE SHOE

SPRUNG COVE PICTURE


CABINET

BED CROWN M PANEL BATTEN PANEL M GLOSS M FILLET ASTRAGAL



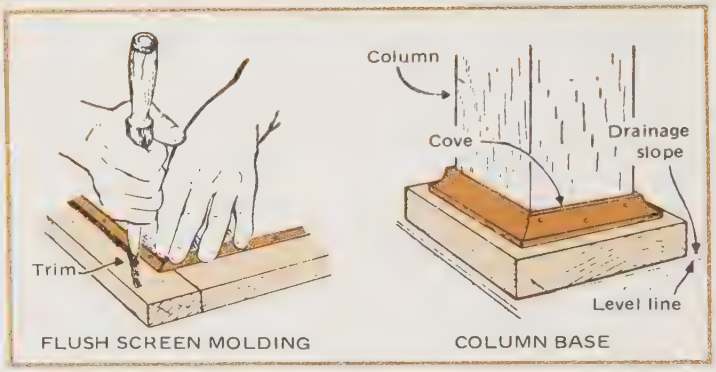
▲ *To cope a molding, cut it at the opposite angle from outside mitering and use arris as a guide for cutting the end profile.*

below the surface and reinforce the miters with glue blocks rubbed or screwed into the back angles.

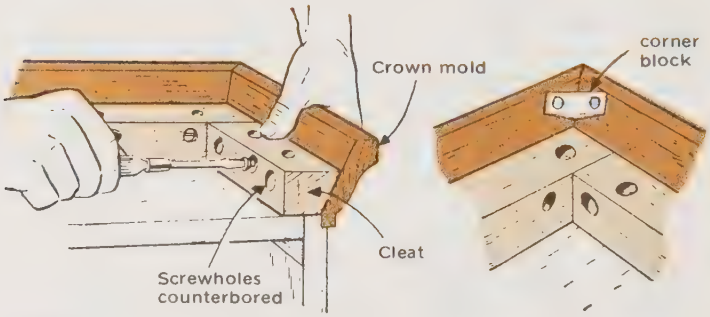
Moldings meeting at inside corners, except in cases where beads are deeply undercut, are fitted by coping. One piece, usually the shorter, is cut square at the inside end and fastened in place. The other is mitered back at the opposite angle for making an outside joint and the line shown is followed with a coping saw, forming an end profile to fit against the other molding. Remember that all wood must be cut back horizontally to prevent interference. After the coped joint is fitted, mark the length of the piece and miter the other end for its outside joint.

Once you've mastered these uses of moldings, you have just scratched the surface of the many styles, materials, and layouts in which moldings can be used. M.E.

See also: WOODWORKING.



FLUSH SCREEN MOLDING COLUMN BASE



SCREWING ON CAP MOLD

All about Nails and Nailing

How to choose and drive nails, including curved nailing and blind nailing

NAILS ARE MADE in a wide range of sizes from most common metals and usually named according to their use. There are common, casing and finishing nails, brads, and spikes; these classifications are broken down into the special purpose types (roofing, casing, clapboard, flooring, finishing, etc.) for which the nail is designed. Each type varies in length and diameter. Nails used to be cut from a flat plate and the term "penny" referred to their weight. Today "penny" refers to length rather than weight. Thus twopenny nails are 1-inch long, threepenny are 1¼-inch, fourpenny are 1½-inch, fivepenny are 1¾-inch, etc. in size, common nails run from 2d (d meaning penny) to 60d. According to size, 1,000 nails will weigh from 1½ lbs. to 40 lbs. Diameters are given in thousandths for convenience in selecting the right undersized drill so that a hole can be made first to prevent splitting. Flat head nails are measured from under the head to the point, oval and round countersunk head nails are measured from larger diameter of countersunk head to end of point; flat countersunk and cement-coated nails are measured from top of head to end of point. If you want rustproof qualities, use galvanized or copper nails or (where materials are too tough for copper) use brass or bronze. To secure sheet aluminum and where acids or fumes make steel or copper unsuitable, use aluminum or alloy nails.

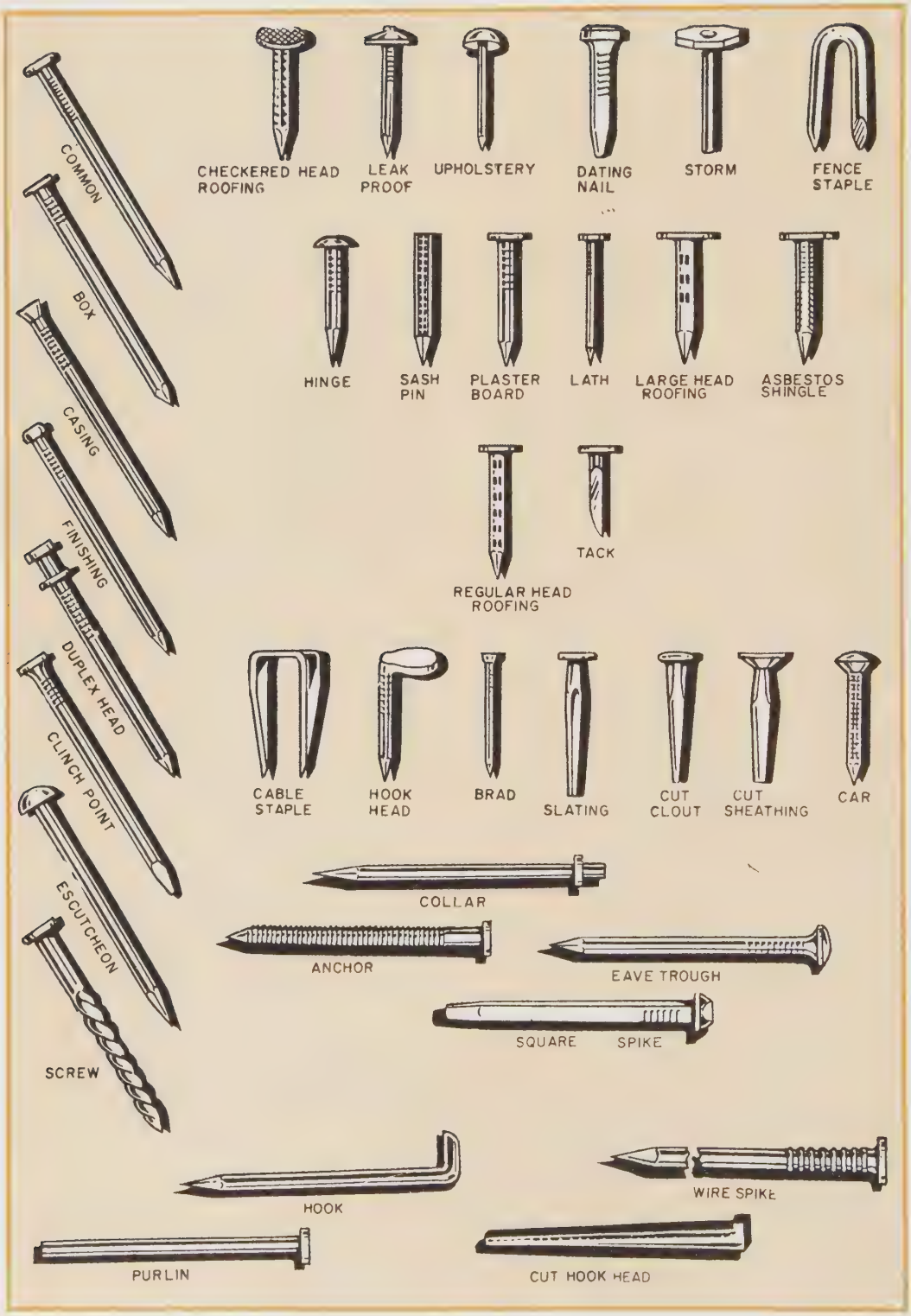
Wood holding qualities. For soft woods, such as pine, use more nails than you would on hardwoods. In general, however, use ½ the number of nails you would use on hardwood if you are working with Douglas fir or southern pine. White pine holds nails almost three times better than Douglas fir.

To hold properly, a nail should have a length 3 times the thickness of the lumber. Nails driven into cross-grain hold much better than nails driven into end-grain; the latter should be more frequent and longer to compensate for poor holding qualities. Galvanized shingle nails should be used in green lumber, which tends to rust and loosen untreated nails. Some nails are barbed to hold better in dry wood (the spring in green lumber acts as a vise). Select point type that suits your needs.

Cement-coated nails tend to hold better as driving friction warms up cement, which on drying, tends to bind nail and wood together. Large heads are better than small in light materials such as shingles which might tend to pull through. Cut nails hold better than wire nails since their straight shanks tend to cut rather than spread wood fibers (as round shanks do). Cut nails are advised for wooden boat construction where wood constantly expands and contracts. Don't use wire nails on copper roofing as small ridge or shoulder on underside of head tears metal when nail is driven home; also head lacks gripping surface needed.

Driving the nail. To prevent splitting, drill undersized hole prior to nailing. Hole should be $\frac{1}{32}$-inch less than diameter of nail, somewhat more for very large nails. Coat nail with beeswax or paraffin when

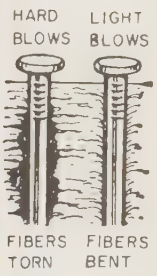
nailhead staining: see painting, house


COMMON
BOX
CASING
FINISHING
DUPLEX HEAD
CLINCH POINT
ESCUTCHEON
SCREW
CHECKERED HEAD ROOFING
LEAK PROOF
UPHOLSTERY
DATING NAIL
STORM
FENCE STAPLE
HINGE
SASH PIN
PLASTER BOARD
LATH
LARGE HEAD ROOFING
ASBESTOS SHINGLE
TACK
REGULAR HEAD ROOFING
CABLE STAPLE
HOOK HEAD
BRAD
SLATING
CUT CLOUT
CUT SHEATHING
CAR
COLLAR
ANCHOR
EAVE TROUGH
SQUARE SPIKE
HOOK
WIRE SPIKE
PURLIN
CUT HOOK HEAD

NAIL SIZES—No. 1

	BRIGHT COMMON NAILS			SMOOTH BOX NAILS	
Size	Length, In.	Gage No.	No. per Lb.	Gage No.	No. per Lb.
2 d*	1	15	876	15½	1010
3 d*	1¼	14	568	14½	635
4 d	1½	12½	316	14	473
5 d	1¾	12½	271	14	406
6 d	2	11½	174	12½	236
7 d	2¼	11½	161	12½	210
8 d	2½	10¼	106	11½	145
10 d	3	9	69	10½	94
12 d	3¼	9	63	10½	87
16 d	3½	8	49	10	71
20 d	4	6	31	9	52
30 d	4½	5	24	9	46
40 d	5	4	18	8	35
50 d	5½	3	14		
60 d	6	2	11		

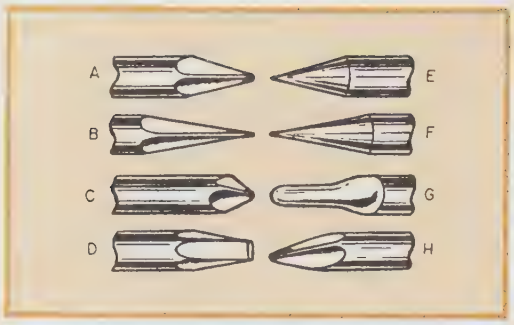
* Blued common nails.



NAIL SIZES—No. 2

	FINISHING NAILS			CASING NAILS	
Size	Length, In.	Gage No.	No. per Lb.	Gage No.	No. per Lb.
2 d	1	16½	1351	15½	1010
3 d*	1¼	15½	807	14½	835
4 d*	1½	15	584	14	473
5 d	1¾	15	500	14	406
6 d*	2	13	309	12½	236
7 d	2¼	13	238		
8 d*	2½	12½	189	11½	145
10 d*	3	11½	121	10½	94
12 d	3¼	11½	113	10½	87
16 d	3½	11	90	10	71
20 d	4	10	62	9	52

* Galvanized finishing nails.



(A) Regular diamond point for general purpose use. May cause splitting in denser woods. (B) Long diamond points are especially desirable where speed is essential in nailing. The long taper permits making a sharper point, helps to set the nail before driving it home. (C) Blunt points are used in denser woods where longer points cause splitting; they tend to punch through wood fibers whereas longer points follow the grain, thereby splitting the wood. (D) Chisel points are principally used on larger nails in hardwood where a strong point is essential. (E) Round points are generally used where a smooth point is necessary, as on carpet nails. Smooth point spreads (instead of tearing or breaking) the fibers of the carpet. (F) Needle or long round points may also be used to prevent tearing of fibrous materials, or for speed nailing. (G) Duck bill points made on smaller diameter nails, are designed for clinching. They are self-clinching when used with a backing or clinching plate. (H) Side points are desirable where clinching is required in a hardwood, and also for minimizing splitting.

driving small nails into hardwoods. Don't use soap as caustic in it may corrode the nail. In driving, grip hammer near the end, and see that hammer head hits nail head squarely. Make your strokes light when starting nail, then increase the power as the nail sinks deeper and deeper. Nails driven lightly tend to retain more holding power than nails driven hard. If nail is bent, yank it out and use another. Remember in withdrawing to place piece of cardboard or wooden block over working surface to prevent hammer claws or head from marking wood. Holding a nail with pinchers may help you in getting it started.

In nailing edge of a long board, stagger nails to avoid splitting. Avoid getting them in the same grain line if possible to prevent splitting and guarantee a strong joint.

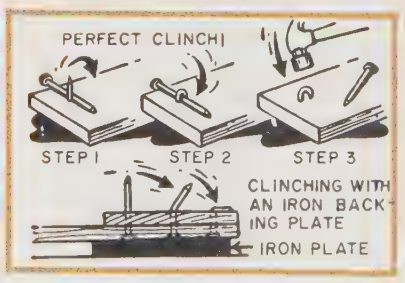
Curve nailing. If you want the nail to go in a curve, grind and file away the nail point to chisel edge form. Then the point will tend to curve in the direction of the flat side of the filed edge.

Secret or blind nailing. To hide evidence of nailing, carefully lift a shaving halfway with the edge of a sharp chisel, making sure that shaving does not break off. Then drive nail into spot uncovered by shaving and carefully set in head. Place adhesive under shaving, put shaving back in place, and hold or clamp it in position until adhesive dries. Then sandpaper.

Toe nailing. For toe or oblique nailing, remember that equal parts of the nails should be in each piece of wood. Toe nailing does not increase strength of a joint, but it does bring the joint more tightly together. Don't put nail in at too acute an angle.

Clinching. Use nails long enough to greatly increase strength, or where only a short distance of exposed nail is needed (as in canoe building) drive nail point against a steel block to fold it tightly. Diagram shows how to make a good clinch.

Countersinking. There are many sizes of nail sets. Use smallest possible size in every case, and drive head in as little as possible. Where recess will be puttied over, drive in just far enough to provide space for putty to hold. With Plastic Wood, only about ⅛-inch depression is needed, as Plastic Wood is an adhesive as well as a filler.



Boating's "Rules of the Road"

The basics—the ones that prevent collisions—are simple, and they can save your life and property. Start there and progress to the finer points, such as reading harbor lights, so you can increase the usefulness of your boat

A COLLISION AFLOAT can be expensive in terms of damaged and lost boats and tragic in terms of injured or killed boatmen.

Fortunately, collisions at sea, or on lakes, rivers, or bays, are easy to avoid. Just follow the nautical "Rules of the Road." There are four separate sets of such rules and you need only follow the rules that apply to the waters on which you do your boating. All the major provisions are similar anyway, in respect to recreational craft.

International Rules are those used out on the open ocean, by ships of all nations, everywhere in the world. *Inland Rules* are used in coastal waters and most other waters within the United States. *Great Lakes Rules* apply on the Great Lakes and their tributaries, and on portions of the St. Lawrence Seaway. *Western Rivers Rules* are used on the Mississippi River and its tributaries and their tributaries.

The purpose of the rules, all of them, is to prevent collisions. Thus, they establish running light requirements so that boats not only can be seen at night, but size, type, and approximate course determined. Provision is made for determining right-of-way in meeting, crossing, and passing situations; signals are specified to clarify the actions to be taken in these situations. Finally, signals are specified to be used in fog or other conditions of thick weather, again so that the type of boat and approximate course can be determined, although the boat itself may not be seen.

Running lights. The first thing to consider is the requirement for running lights. Those specified by the Great Lakes and Western Rivers Rules for small craft are

nailsets: see hand tools
nautical terminology: see sailing
neoprene-base adhesive: see adhesives
nine-unit stereo speaker: see speakers
nitrogen compounds: see fertilizers

the same as those called for by the Inland Rules. International Rules do have significant differences. All the rules specify that running lights be shown from sunset to sunrise.

All rules also specify an "arc of visibility" for each type of running light, in terms of the 32-point circle used by mariners on the old sailing ships. Each point is equal to 11¾ degrees on the 360-degree compass rose. Thus there are 10-point lights that cover an arc of 112.5 degrees; 12-point lights that cover an arc of 135 degrees; 20-point lights that cover an arc of 225 degrees; and 32-point lights that can be seen clear around the 360-degree circle.

Under the Inland Rules, Class A and Class 1 power boats—anything under 26 feet long—must carry a white stern light of 32-point (360 degree) arc of visibility. This usually is mounted on a stern staff that raises it above the level of the forward colored running lights. It should be visible for a distance of at least two miles on a clear night, from all directions, under all conditions of trim. On outboards it may be mounted to one side of the transom, rather than on the centerline at the stern.

These boats also must carry a red and green combination light forward. The red light, on the port side, must be visible for a distance of one mile through an arc of 10 points, from dead ahead to two points abaft the port beam. The green light, on the starboard side, also must be visible for one mile from dead ahead to two points abaft the starboard beam.

Larger power boats, those of Class 2 and Class 3, from 26 feet to 65 feet in length, carry the same 32-point stern light as the smaller boats. It must be placed so that it is higher than a 20-point forward white light, which also is required.

On the Class 2 and Class 3 boats, the single combination red and green light is replaced by separate side lights, with a 10-point red light to port, and a 10-point green light to starboard. Both must be visible for one mile from dead ahead to two points abaft the beam on their respective sides. They must be so screened that they do not show across the bow.

The United States Coast Guard has tested bulbs and lenses to see just what meets its visibility requirements. Note that the popular green light with a plain, smooth lens does not meet the one mile visibility requirement. A green fresnel type lens does meet the requirements. Because red is visible for a greater distance, the plain lens is acceptable here.

Sailboats, when under sail only, carry the red and green lights appropriate to their length class, plus a 12-point stern light showing aft, visible for two miles, and carried as nearly as possible at the same level as the colored lights. A boat under both sail and power must carry the lights required for a power boat of its length class.

In bad weather, small boats under sail may show an electric torch or a lighted lantern to an overtaking vessel, if necessary. If they cannot keep their colored side lights fixed in these conditions, the side lights may be kept at hand ready to show in time to avert a collision.

Operators of row boats need only keep a flashlight at hand, to be shown on the approach of another vessel.

Under the International Rules, the side lights for any power boat under 65 feet in length may be either separate red and green 10-point lights or a combination red and green light.

Sailboats less than 40 feet long may carry a red and green combination light, plus a 12-point light showing aft; larger sailboats must carry separate 10-point red and green lights, plus the 12-point white stern light. As an option, sailboats over 40 feet in length may carry on the top of the foremost mast two 20-point lights. The upper one must be red, the lower one green, and there must be enough separation be-

tween them that they may be distinguished easily.

International Rule requirement for rowboats is the same as the Inland Rule: Carry a flashlight or lantern that can be shown to an approaching vessel.

Under all rules, a boat at anchor, not in a "Special Anchorage Area," must display a single 32-point white light. Inland Rules call for it to be forward, where best seen, and visible for two miles. International Rules say it should be at or near the bow, and visible for two miles.

By "reading" the running lights, you can determine the approximate size and type of other vessels you see at night, and the approximate course of each. Note that vessels engaged in specific occupations, such as fishing, towing, dredging, etc., carry additional lights that identify these occupations. All are described in the various Rules of the Road. All the Rules are published by the United States Coast Guard, and are available from local district offices. International-Inland Rules are publication CG-169; Great Lakes Rules are CG-172; and Western Rivers Rules are CG-184. "Piloting, Seamanship and Small Boat Handling," by Charles F. Chapman, also lists, describes, and illustrates all the special lights required under the four sets of rules.

Meeting and passing situations. If you can see another boat, by day or night, and identify its approximate course and speed, it is a big step in the prevention of a collision. The next step is to determine who has the right of way, and the duties and responsibilities of each skipper in various meeting and passing situations.

Whenever one boat has the right of way over another, it is called the "privileged vessel." It can proceed unhindered by the other vessel; it maintains course and speed. The other boat is called the "burdened vessel," and it must alter course, slow down, stop, reverse, or take whatever combination of actions may be necessary to avoid a collision.

There are three types of "passing" situations to be considered: meeting, crossing, and overtaking. The four sets of rules are identical as to right of way and privileged and burdened vessels in each situation.

A meeting situation exists when two power boats (sailboats will be considered separately) are approaching head on, or nearly head on. In a meeting situation, neither boat has the right of way, neither is privileged, neither is burdened. The proper procedure is for both boats to alter course to starboard, and pass port side to port side. If the projected courses are such that they will pass port-to-port with ample clearance without changing course, they may do so, but if a change of course is necessary, the change should be so pronounced and definite that it will be readily seen and understood by the operator of the other boat.

Under Inland Rules, either boat may signal first, with a single short blast of the whistle (a blast of about one second) to indicate the intention of passing port-to-port. The other boat replies with the same signal to indicate that this intent is understood. If the second vessel's skipper considers the port-to-port passing to be dangerous, or if he has any doubt as to the situation, he answers with the danger signal of four or more short blasts.

If the boats are to starboard of each other, and their projected courses indicate that they will pass well clear of each other, they may maintain course and legally pass starboard-to-starboard. Either boat then would give a signal of two short blasts, and the other boat would reply with the same signal to indicate that the intent is to pass starboard-to-starboard, and that this intent is understood.

Never answer a single blast with two blasts, or vice versa. These are known as "cross signals," and are prohibited by the

rules. In any case of doubt, reply with the danger signal.

A crossing situation exists when two boats are approaching each other, not head on, and each has the other on a bearing forward of two points abaft the beam. In this case, the vessel to starboard has the right of way. It is in the danger zone of the vessel to port.

A boat's danger zone is an arc running from dead ahead to two points abaft the starboard beam. This is a total of 10 points, and it covers exactly the same arc as the boat's green, starboard running light. If you see another boat anywhere in this arc, and you are in the zone covered by its red light (by day or night), it is in your danger zone. It is the privileged vessel, it has the right of way. Its skipper may sound a signal of one short blast to indicate he is maintaining course and speed. You must reply with the same signal to indicate you understand his intent. As skipper of the burdened vessel, you must take whatever action may be necessary to avoid a collision.

No action may be necessary. If the relative bearing between the two boats is obviously decreasing, the boat in your danger zone will pass ahead of you; if the relative bearing is obviously increasing, you should pass ahead of it with no change in course or speed. If the bearing seems to remain about the same, however, it is a "collision bearing," and you, as skipper of the burdened vessel, must take whatever steps are necessary to avoid the collision.

An overtaking situation exists when one vessel is coming up on another from any point two points abaft either beam of the boat being overtaken. The boat that is being overtaken is the privileged vessel; it should maintain course and speed. The overtaking vessel is burdened, and must keep clear.

In this case, the burdened vessel signals first to indicate on which side it intends to pass. A single short blast indicates passing on the starboard side of the overtaken vessel; and two short blasts indicates passing on the port side of the overtaken vessel. The privileged vessel, the one being overtaken, answers with the same signal to indicate that the intent is understood.

If there is any doubt, or the skipper of the privileged vessel believes the intended action would be dangerous, he sounds the danger signal. In this case the overtaking vessel slows down and remains behind until the situation is clarified.

Note that under Inland Rules the boat that signals first is indicating intent; the second boat replies with the same signal to indicate that the intent is understood, and that the proposed action appears to be safe.

Under International Rules, whistle signals indicate an action that will be taken; they are "rudder signals." A single short blast means "I am altering my course to starboard." Two short blasts mean "I am altering my course to port." No signal is given in reply under the International Rules. The danger signal is sounded only by the privileged vessel when it is in doubt as to whether action taken by the burdened vessel is sufficient to avoid a collision. The International Rules danger signal is five or more blasts.

When a power boat is in a meeting or crossing situation with a sailboat under sail only, the sailboat always has the right of way, even if it is in the power boat's danger zone. If a sailboat is overtaking a power boat, however, it is the burdened vessel and must keep clear of the power boat.

A sailboat under sail *and* power is treated exactly as a power boat. Sailboats under sail only do not initiate or reply to whistle signals.

Two sailboats, under sail only, observe their own set of rules. Under Inland Rules, a vessel that is running free keeps clear of a boat that is close hauled; a vessel close hauled on the port tack keeps clear of a vessel close hauled on the starboard

tack. If both boats are going downwind with the wind on different sides of the hulls, the vessel with the wind on its starboard side has the right of way; and if both are running free with the wind on the same side, the one that is to windward must keep clear of the boat that is to leeward.

International Rules specify that when each sailboat has the wind on different sides, the one with the wind on its port side must keep clear; and when both have the wind on the same side, the vessel to windward must keep clear.

Operators of small craft should keep in mind a provision of the Inland Rules regarding operation in a narrow channel. A small boat cannot claim right of way over a large vessel in a channel, if to do so would cause undue hindrance to the passage of the large vessel. In other words, use common sense in the vicinity of large commercial craft of limited maneuverability.

In conditions of fog, heavy rain, snow, or other "thick weather," boats are required to sound signals at intervals for the purpose of indentification. If you can't see another vessel, you can determine its approximate location and course from its signals, as well as the type of vessel it is.

A power boat under way, not towing another vessel, sounds one prolonged blast (five to six seconds) on its whistle or horn at intervals of not more than one minute, under the Inland Rules. A power boat that is under way and towing another vessel (a tug with a barge, for example) sounds one long blast followed by two short blasts, also at intervals of not more than one minute. This signal *may* be repeated by the vessel being towed.

A sailboat under way on the starboard tack sounds one prolonged blast on its foghorn at intervals of not more than one minute, two prolonged blasts when it is on the port tack; and three prolonged blasts if the wind is abaft the beam.

International Rules are the same, except that power boats need sound their signal at intervals of not more than two minutes.

▲ *The power boat is lying dead in the water. If it were moving it would be required to keep clear of the sail boat, which usually has the right of way over a powered boat.*

When both skippers know the correct action to be taken in any right of way situation, there's no chance of a collision. But if you have the right of way, and the other skipper is ignorant of the rules and does not give way, what do you do? Do you let him hit you, then sue for damages? You had better not, because you would be held as much as fault as the other operator.

Each set of rules has its "General Prudential Rule." It is the duty and responsibility of the skipper of the privileged vessel to alter course, slow down, stop, reverse, or take whatever other action may be necessary to avoid a collision if the skipper of the burdened vessel gives no indication he is not changing course or speed.

Reading the lights. Many small-boat skippers avoid traveling after sunset because reading the lights is an unfamiliar, somewhat frightening experience. Admittedly, if you're unaccustomed to cruising

through darkness, the initial exposure can be a bit difficult—somewhat like docking your first cruiser or running your first inlet. Looking back on it from an old salt's viewpoint, you'll find it's a cinch.

Imagine you're at the wheel of an outboard runabout several miles from shore after midnight. You can see a circular glow on the horizon—the street lamps and skyscraper lights of a big city such as Miami, Los Angeles, Boston or New York. Dead ahead is a flashing buoy—perhaps a dozen of them in view. There's a lighthouse; the running lights of a small-boat flotilla; the anchor signal of a big auxiliary sailboat. Here's how to read them as simply as your morning newspaper.

Change your basic piloting approach. You can't spot a water tower, distinctive cliff formation or a familiar yacht club pier and point your bow in that direction, so don't even try. You'll have to make use of a United States Coast & Geodetic Survey chart along with some uncommon horse sense to pick a safe course through the harbor.

Along the way, lights serve as your signposts. By the way they're placed along with basic identification characteristics, i.e., permanently revolving, flashing, etc., you'll be forewarned of shoals and other important navigational facts.

Anybody can leave the dock in broad daylight and steer toward a destination within sight. It takes a bit of training to pull away from your home mooring in darkness and know which lights to approach, whether to pass them port or starboard, when to proceed cautiously and when to skim down the middle of the channel without a care in the world. It isn't difficult.

When entering from seaward, the red buoys should be on the right side of the channel returning from a trip offshore—"r-r-r," *red, right, return.* There is no special significance to the shape of a lighted buoy, but the bulb color will be either red or white. It will flash steadily like a series of dots in Morse code, or occult in the identical manner like a succession of dashes. It may be a measured slow flashing or a quick flashing light, the latter indicating particularly important turns or wrecks where caution is required.

The black buoys will be on the left side of the channel. They'll be lighted white or green, otherwise showing the same signals we've mentioned above. Since they're all marked on your chart, it's a simple matter to pinpoint your location by spotting a light afloat and on your nautical map.

Mid-channel buoys will be lighted white only, flashing "dot dash, dot dash" or "short long, short long" in a steady measure. Once you've made a sure identification, you can pass these markers on either side. Junction buoys will be either white, red or green and will show the light characteristic of interrupted quick flashing—a series of six dots, then a pause followed by a resumption of the original signal.

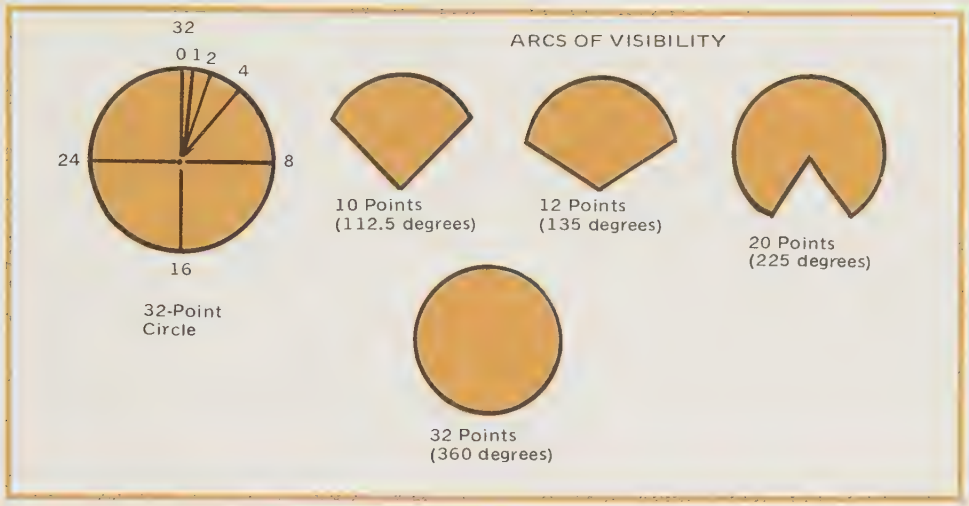
Does this sound unduly complicated? Really, it's not. The pattern is the same as traffic signals on any metropolitan highway. You soon learn which lights must be observed and obeyed; which can be discounted as advertising billboards or motel signboards along the borders of a turnpike. Just as in night driving, ease in nocturnal piloting increases as you gain more experience.

How about bad weather? It's difficult to stay on the road in heavy fog or a pelting rainstorm; it's harder to keep a boat on course when visibility is low. When things "sock in," you go easy on the throttle. Traveling slower and watching attentively, you're less likely to go astray than on an evening when every star seems right at your fingertips.

This does not mean that it's wise to go cruising when weather conditions are poor; rather that an experienced hand who knows

Boating's "Rules of the Road"

1717



MEETING SITUATIONS

When two powered vessels meet head-on, neither is the privileged vessel. Each must keep clear of the other. In the simplest situation, they pass port-to-port.

In a passing situation, the passing vessel is always the burdened vessel and must keep clear of the privileged craft it is overtaking.

If you are at the helm of one of these two boats in a crossing situation and you see the other craft to your starboard, you are the burdened vessel and must keep clear of the other. If you see the other vessel on your port, you are the privileged vessel and the other boat must keep out of your way, but stay alert—maritime law requires you to be prudent as well as legal.

THE DANGER ZONE

Your danger zone sweeps the same arc as your starboard (green) running light. If another boat is in this zone and you are in the area covered by its port (red) running light, you are the burdened vessel and must steer clear of the other craft.

what to expect can easily cope with reduced vision when it occurs. You don't go searching for trouble at sea but you also don't panic when a little difficulty arises.

Keep bright lights and glare from within your own hull away from the man at the wheel. The helmsman uses what we call his night eyes—a keen sense of perception and vision temporarily destroyed by close-up lighting. As an example, step out of your lighted living room and try to look down the street or across the yard into an area of darkness. Staying out of any light, continue this process for 10 or 15 minutes. At the end of that period, you'll be able to discern much more than you could when you originally left the house.

Now, step into a lighted room; go outside and try it again. For several minutes, until your eyes adjust to the darkness, you'll be very nearly blind. As your night eyes come into focus, you'll discover you can once again see quite well. *When trying to navigate from the cockpit of a small boat at night, stay away from reflected glare!* Don't use a spotlight unless you're prepared to see nothing outside the beam. Don't shine it at another skipper; you might blind him in a situation where he needs all his vision.

How far is that next light off your bow? A bright white light on a high lighthouse atop a cliff is visible for a great distance; a dimly flickering white battery-powered bulb on a buoy only a few feet above sea level can't be seen till you're close by. White lights are visible farthest; red lights less far; green lights least of all. Haze and fog obscure some light signals; glare from street lamps or pier floods can do it too.

By the time you see a green buoy or channel marker on an average summer night, you're right on top of the signal. Throttle down and make a cautious approach. Estimate a blinker that appears to be several hundred feet off is actually less than a hundred and maneuver with that rule of thumb in mind. You can't go wrong being cautious.

When you're looking for a light, remember that you're able to see farther as you gain height. Throttle down and climb on the cabin top. Hang on tightly while you stand on the gunwale or even on a fishbox or seat. All the distances you'll find on the Coast Guard light lists and the various visibility charts are calculated on the basis of the observer's eye being 15 feet above sea level—fine for a ship's officer but a bit higher than the average pleasure craft's lookout.

Know the light's characteristics. Before coming within range, study the chart so you know what you're looking for and recognize it when it appears. It's a mistake to sight the lights first and then attempt to identify them on the chart.

Find the lights you expect to see and note their color, the character of their operation and their range of visibility. Let your eyes wander all through that chart sector and see which other lights should be visible at the same time and their bearings from the original. Keeping this mental map in your mind, climb topside and match your mental picture with the lights in view.

If things don't equate as they should, throttle down to a snail's pace. Approach the nearest buoy or other clearly identifiable landmark where you can pick up a number, etc. Find that point on the chart and set your future course from it.

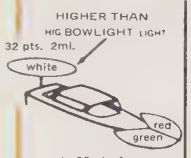
Most small-boatmen won't find these procedures necessary too often for they generally travel in familiar waters rather than cruising far from home. However, let a word to the wise be sufficient. Know how to read the lights before the necessity arises and the actual event will be painless.

Running lights of other small boats. The average outboard carries a combination red and green running signal forward; the red showing through 10 points on the left or port side, the green showing 10 points

UNDER 26 FEET

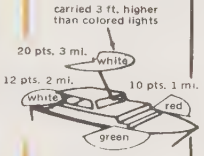
MOTORBOAT

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



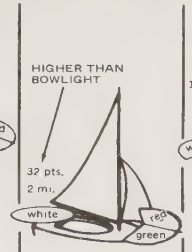
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



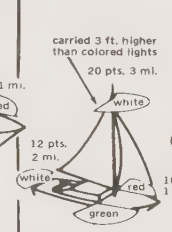
AUXILIARY: SAIL & POWER OR POWER ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



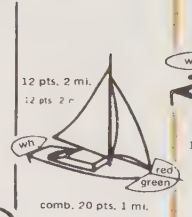
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



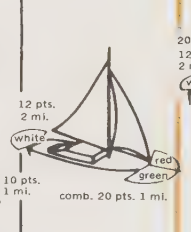
AUXILIARY: SAIL ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

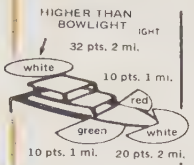
OR



26 FEET TO LESS THAN 40 FEET

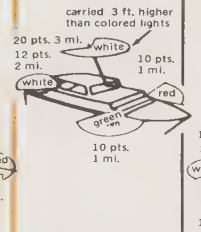
MOTORBOAT

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



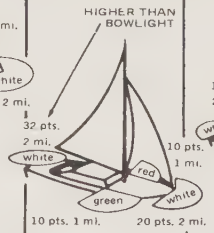
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



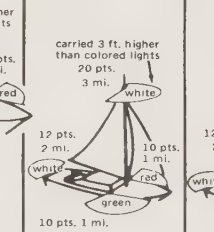
AUXILIARY: SAIL & POWER OR POWER ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



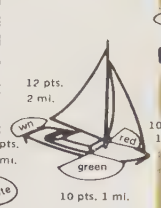
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



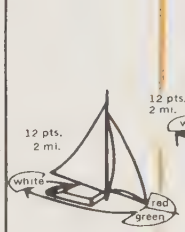
AUXILIARY: SAIL ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

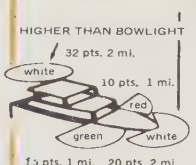
OR



40 FEET TO LESS THAN 65 FEET

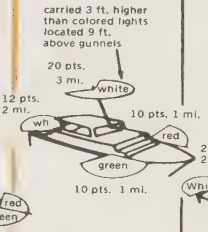
MOTORBOAT

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



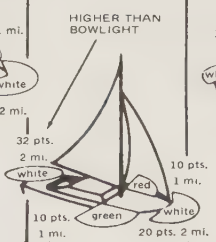
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



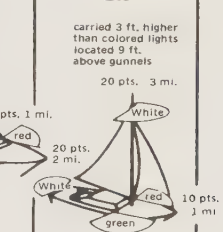
AUXILIARY: SAIL & POWER OR POWER ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



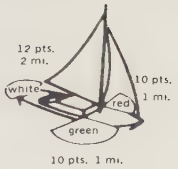
VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR



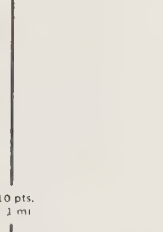
AUXILIARY: SAIL ALONE

VESSELS USING ONLY INLAND WATERS
(Including Great Lakes and Western Rivers)



VESSELS USING INTERNATIONAL WATERS
(May be used on inland waters)

OR

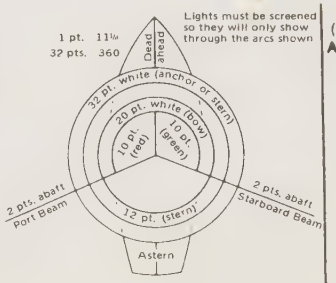


NOTE:

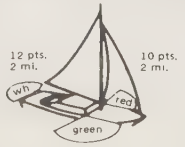
EXCEPTIONS: (1) Western River Rules Sidelights for vessels under sail must be visible for 3 miles (2) Great Lakes On the Great Lakes sailing vessels show a white light (in lieu of a stern light) upon that portion of the vessel which is being approached by another vessel

DEFINITION: "10 pts 1 mi" means that the light can be seen through an arc of 10 points (see diagram at right), for a distance of 1 mile by another vessel

IMPORTANT: LIGHTS MUST BE PLACED HIGH ENOUGH THAT THEIR LIGHT WILL NOT BE BLOCKED BY PERSONS OR PARTS OF THE BOAT OR IT'S EQUIPMENT.

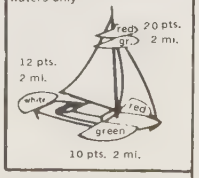

1 pt. 11¼
32 pts. 360
Dead ahead
Lights must be screened so they will only show through the arcs shown
32 pt. white (anchor or stern)
20 pt. white (bow)
10 pt. (red)
10 pt. (green)
12 pt. (stern)
2 pts. abaft Port Beam
2 pts. abaft Starboard Beam
Astern

ALL SAILBOAT (No Auxiliary Engine on Board) ANY LENGTH – ALL WATERS



NOTE: Less than 40 feet in international waters only may carry a combined lantern visible for one mile in lieu of sidelights.

OPTIONAL for all boats under sail alone in International waters only



LIGHTS FOR USE WHEN ANCHORED OR ROWING

POWER BOATS under 65 feet and all Sailing Vessels at anchor must display anchor lights except those under 65 feet in "special anchorage areas." An anchor light is a white light visible to a boat approaching from any direction, and is displayed in the fore part of the vessel.

ROWING BOATS: Rowing boats whether under oars or sail shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision

on the right or starboard. Astern, she carries a white light visible around all 32 points of the compass through a distance of two miles. The combination light must be able to be seen a mile away—*technically.*

In practice afloat, you'll discover boatmen with dim lights, lights shaded by rags or hats, sometimes no lights at all. The Coast Guard requirements above are those for a powerboat on inland waters, Western rivers or the Great Lakes when the hull is under 26 feet. The rules vary for boats carrying power and sail, a sailing auxiliary, or a sailing vessel exclusively. They change according to the boat's length and differ on international instead of inland waterways.

It isn't necessary to make an exhaustive study of running and anchorage lights beyond the simple factors you'll use on most every cruise. If you can see a red and green light bearing down on you, it's another boat on a collision course. Swing the wheel and gun the engine till you can see only one color.

If you sight only red, and the other boat's headed toward you (which you'll generally be able to tell by the white light aft), you're looking at her left side from forward; you're to the right of her and will pass according to the rules of the road—port to port. If you can see only green, you're to the left of her but still in no danger of collision unless somebody changes course.

To summarize the situation and condense it considerably, red running lights are on a boat's left side, green to starboard. White lights are carried higher and aft or directly on the bow of vessels larger in size. When you see both red and green at the same time, do something posthaste or you're liable to experience a seagoing tragedy.

Recommendations. Don't run without lights. Sooner or later, operating a small boat sans lights will bring you to the edge of disaster.

United States Light Lists are now available in localized form as government publications. You can pick up a Geodetic Survey chart and a Local List for a minimum cash outlay, then coordinate the two so you can travel most anywhere along our buoyed waterways with little effort. You'll easily be able to identify the illuminated buoys and lighthouses along the coast by their flashing and revolving characteristics.

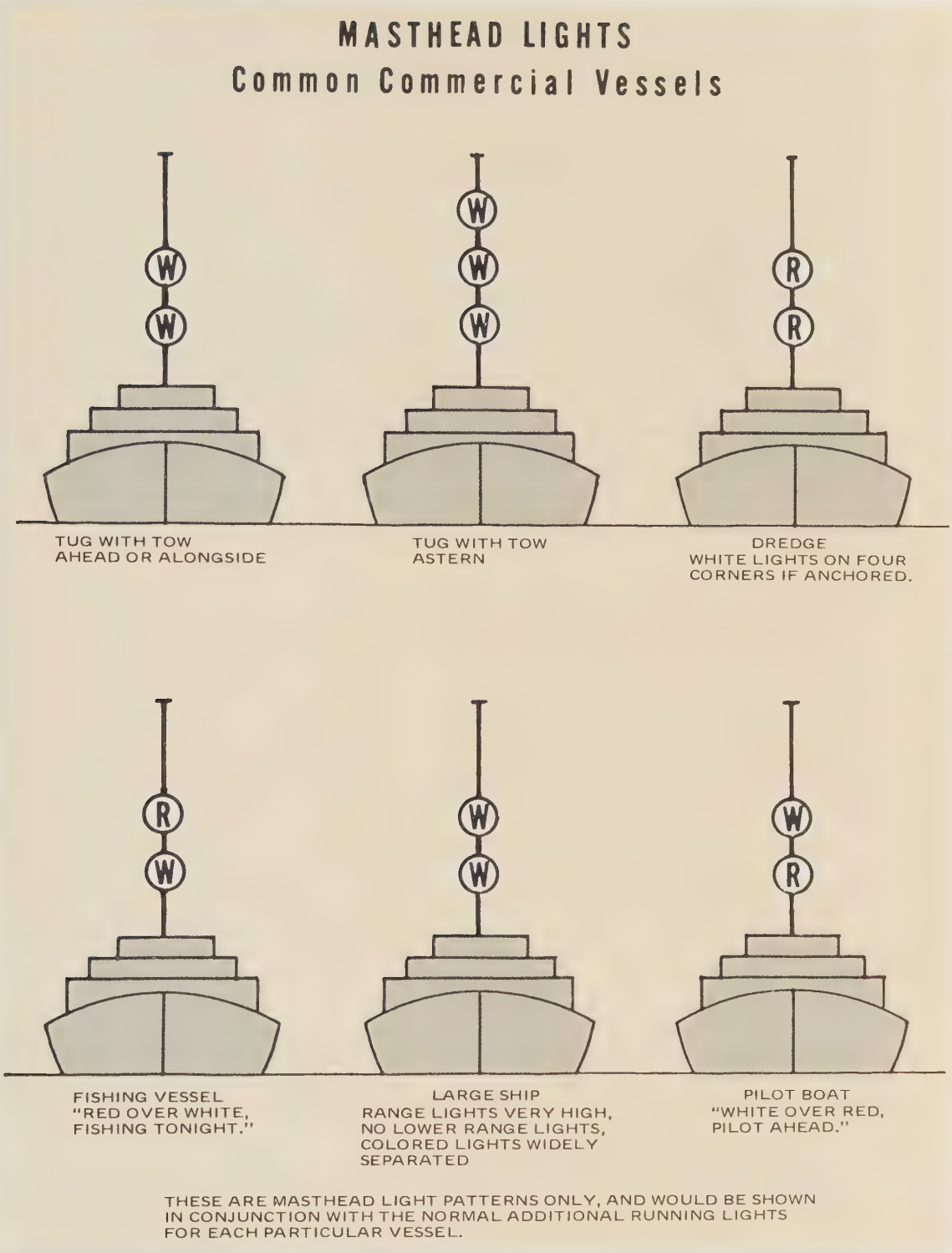
Many of the larger oil companies and organizations like the Outboard Boating Club of America issue publications that include detailed sketches of various classes of small craft and how their running lights are set up according to law. Pick one up and give it a reasonable scrutiny, memorizing the essentials if not the fine points.

If you have the stowage space, store your light literature aboard where it will be available when a question comes up after sunset. In open runabouts where this is impractical, take a plastic bag along containing these navigational reference pamphlets when you have reason to be out during the hours of darkness.

If possible, learn the easy way. Try to go out with an experienced night skipper a few times before trying it on your own. An old-timer can teach you more about reading the lights and running ranged courses between them in a few hours of practical experience than you'll pick up in weeks of concentrated bookwork. Most men who know will be glad to pass on this knowledge to someone who's admittedly just starting out.

Don't be afraid of cruising after dark. Once you get on to this new technique, crowded channels suddenly thin out till you can sail almost entirely on your own. Instead of waiting for weekends to come home from work and go out for a spin, you can enjoy yourself afloat most every evening. Try it.

See also: BOAT HANDLING; BOATING; DOCKING, BOAT; SAILING.


MASTHEAD LIGHTS
Common Commercial Vessels
W
W
TUG WITH TOW
AHEAD OR ALONGSIDE
W
W
W
TUG WITH TOW
ASTERN
R
R
DREDGE
WHITE LIGHTS ON FOUR
CORNERS IF ANCHORED.
R
W
FISHING VESSEL
"RED OVER WHITE,
FISHING TONIGHT."
W
W
LARGE SHIP
RANGE LIGHTS VERY HIGH,
NO LOWER RANGE LIGHTS,
COLORED LIGHTS WIDELY
SEPARATED
W
R
PILOT BOAT
"WHITE OVER RED,
PILOT AHEAD."
THESE ARE MASTHEAD LIGHT PATTERNS ONLY, AND WOULD BE SHOWN
IN CONJUNCTION WITH THE NORMAL ADDITIONAL RUNNING LIGHTS
FOR EACH PARTICULAR VESSEL.

The sun is setting, but you want to fuel your boat and start your weekend right away. You can, if you know how to use your compass.

The Simple Way to Steer by Compass

Using a compass to navigate from one point to another is a lot easier than some experts make it sound. Here's how to do it, as well as how to install a compass in your boat and how to adjust it

YOU CAN, WITH A BASIC grounding in compass know-how, easily plot a course to follow in open water. You can learn to take bearings, which locate your position. This little stunt will be useful on an inland lake or out at sea, aiding you in returning to a favorite fishing hole time after time. And a compass helps you return swiftly to launching ramp, fishing camp or marina—even after dark.

Let's look at this most useful of boating accessories.

The marine compass is a type usually described as "wet." It means the compass card, with magnetized needles made fast to it, floats on a fluid in a bowl—usually alcohol and water, but a viscous, oil-like liquid in higher-priced units designed for use in rough water. Actually, cheaper marine compasses are dry. They resemble the wet type, but the card "floats" only on a bearing.

You can make a wet compass at home, for a complete grasp of the theory. Magnetize a needle from the sewing basket. Just rub it on any magnet; you may find one on your refrigerator or cabinet door locks.

Float a piece of paper in water in a small dish or bowl. Lay the needle in its center. The paper will slowly revolve until the needle points in a north-south line. Move

it about the room; the needle will always swing until it points north.

This is the marine, or wet compass. The liquid supports the weight of the card and it "dampens" or slows down the tendency of the card to swing in a rocking, rolling, pitching boat. A dry compass goes wild in bumpy water; and it doesn't have to be very rough—just choppy.

The compass card is marked primarily with the major compass points. North, east, south and west are the cardinal points; northeast; southeast, southwest and northwest are the intercardinals. Make up another set of combination names, each point lying halfway between the others, and you have all the compass points the average small boatman will ever need. These are, taking the first part of their name from the nearest cardinal point:

NORTH-northwest. EAST-northeast. East-southeast. SOUTH-southeast. SOUTH-southwest. WEST-southwest. WEST-northwest and NORTH-northwest.

They are simply a combination of the cardinals and intercardinals and lie between them. The total of them all is 16 points. Actually, there are 32, but for the guy who runs an outboard or sterndrive boat, 16 will do nicely. If you want to learn all of them, see the accompanying list. When you recite all the 32 points of the compass, you "box" it.

Remember the cardinals, intercardinals, and combinations. We'll be coming back to them in a moment, showing how you use them.

The secondary way in which a compass card is marked is with degrees in numerals. North is zero. East is 90, south 180, west 270 and so on. Navigators usually speak in three figures, to prevent confusion; they'll describe east as "zero-nine-zero," for example.

Most modern boatmen steer only by compass—but it isn't always the only way, and sometimes the old-fashioned point system is better. We'll see why in a moment or two.

Note one more thing: the compass card is still marked—on most units—with a series of lozenges or diamonds for major points. This is a tidy little hangover of ancient tradition. Back in the time of Columbus, few sailors could read. For them, compasses were marked only with patterns they could understand.

Before you can use a compass, you must install it. And here is where the majority of small boat owners go awry. It isn't a technical matter; it is one of understanding the frailties of a magnetic compass and allowing for them.

A compass is extraordinarily sensitive to masses of ferrous metal—meaning iron and steel. (It can happily ignore brass and aluminum.)

So, never install a compass near any

BOXING THE COMPASS

There are 32 points of the compass. Naming them in order from north is called "boxing the compass." It is almost a lost art. Few modern boatmen can do it. One reason may be that it is hard to learn by rote. Rather than memorize, try and see how it is all systematically developed from logical combinations of names. Just learn the system from north to east, and you can switch names and box the entire compass.

NORTH
north by east
North Northeast
northeast by north
NORTHEAST
northeast by east
East Northeast
east by north
EAST
east by south
East Southeast
southeast by east
SOUTHEAST
southeast by south
South Southeast
south by east
SOUTH

SOUTH
south by west
South Southwest
southwest by south
SOUTHWEST
southwest by west
West Southwest
west by south
WEST
west by north
West Northwest
northwest by west
NORTHWEST
northwest by north
North Northwest
north by west
NORTH

Note that all the cardinals and intercardinals are capitalized. The combinations made from these two are in italics. The others are easily formed from the nearest cardinals or intercardinals, with the word "by."

Nothing to it, really. Learn the system and join the few boatmen who can box the compass.

mass of iron. This is an inviolable rule. Don't break it, or you partially destroy the usefulness of a compass and make it necessary for you to go into highly complex factors of correction for error in use.

Fortunately, on nearly all outboards and inboard/outboard boats, a compass need never be installed near the engine. The only other ironware to watch out for is the steering wheel and control systems. Some (not all) steering wheels have iron in them. Mount a compass near this type and you'll go mad. The error changes with each twist of the wheel; you can never catalog it or even pin it down.

Also, keep the compass away from *single* electric wires. A pair of wires twisted together tend to cancel out each other's magnetic field, generated as current flows; a single wire, when the current is on, can force a needle to deviate from its proper reading.

Finally, when mounting a compass, locate it as close to the centerline of the boat as possible, and see to it that the "lubberline," or that vertical mark against which you read your directions, courses and what-not, is in perfect alignment with the boat's keel.

Hold a compass in place and move it about by hand. Check for deviation of the needle, pulled off-line by iron or wiring. Find a spot to put it where you are reasonably certain it is free from disturbing influences. Then mount it firmly in place.

Steering by compass isn't especially complex. You simply turn the boat about until the desired reading, either as a cardinal, intercardinal or combination; or as a reading in degrees, appears on the lubberline.

But keeping it there is another dish of tea. There was once a gentleman who had just graduated from a course in piloting and boat-handling. All his knowledge was classroom know-how. He got at his wheel, started up, sped out on the broad, sparkling bay—and began running in circles.

His instructors had filled him with theory, but had failed to pump a little practical know-how in along with it. He just didn't know how to steer by compass.

Doubtless he is unusual. But for any neophyte boatmen who have encountered the same problem, here is a simple tip:

You turn the wheel left to LOWER the reading; you swing the boat to the right to RAISE it.

Left to lower; right to raise. Pack this phrase in the back of your mind, and steering will become—with practice—very simple.

If you are trying to steer 180 degrees, and the reading drifts upward to 185, 186 and keeps rising, you would. . . .

Turn LEFT to LOWER it—and get it back on 180.

Cheap compasses are inclined to lose their nerve in choppy going. The card makes like a whirling dervish. You can't steer at all by compass. But you can still use it:

Come to a halt. Lie in the water until the card settles. Get the boat on course, and notice a small cloud ahead or the angle and relative position of the sun. Then open the throttle and chase that cloud or keep the sun in the same relative position for ten minutes or so. Repeat if necessary to continue steering on a straight course.

This is the only way to use a compass with ease even if it has a steady card. You can't run a boat with your eyes glued to a jiggling compass card. So make it a point, once you are on course, to chase clouds or keep the sun "over your shoulder" (or wherever it should be) for relatively long periods of time.

It's the only way to enjoy the day. Otherwise you're in the position of the poor soul who walks in the gutter keeping his eyes down and looking for stray pennies. He never sees the sun or enjoys the sight of blue sky ahead.

Don't laugh off this business of cloud-

chasing or sun-watching as an aid to the use of a compass. You can utilize the sun's relative bearing for runs in rough water as long as 50 miles.

You need the compass for such passages as a long run across a broad bay or sound —or even a large lake—to an exact destination: a park, beach, islet, or inlet. Only by using a compass can you make a fast six or seven-mile voyage to a desired spot, without hunting for it.

But, as noted, the compass is subject to errors—about which more later on. There is also a chance of steering error.

To be certain of your landfall, and the shortest run in the briefest time to that park, pier, beach or what-have-you, learn to steer by "deliberate error."

In short, if you know a certain boatmen's park lies east-southeast of the launching ramp, about seven miles, make it a point to steer *due east.*

Naturally, this will bring you in just a bit to the north of your desired destination. So just swing to the south'ard and run down to it.

Why?

Well, suppose you make a steering error —or suffer other errors of which you are not aware—that pulls you to the south of your chosen course.

The chances are good that you will only come in within sight of your destination anyway.

And, if the error is of a type that will pull you off course to the north—well, you know you are north of the destination so you turn south and find it anyway.

This little stunt makes allowances for compass errors, and enables you to reach a desired destination on relatively short runs—under ten miles as a rule—without the need for hunting along the coast.

Remember this when the navigatin' experts begin to tell you how careful you must always be.

A ten-degree compass error is translated into a distance of ten miles off course at the end of a run of 60 miles. That's only one mile off at the end of a six-mile run.

So even if you do nothing else at all about using a compass than learn to steer by deliberate error, you can always pick up your chosen landfall within easy sighting distance, or run it down.

If you are going to be a navigator and make substantial runs out of land's sight or beyond the sight of visual landmarks, then you will have to be more choosy. For most people, however, this is almost enough.

What are these "errors" we are continually referring to? There are, for the owners of small powerboats, only two important ones: variation and deviation.

Variation is a difference between true north and geographic north. As you learned in school, a compass doesn't point to the true north pole. It indicates, instead, "magnetic north," which lies somewhere above Hudson Bay.

If you use charts and plot a course, you need never concern yourself with variation. Just use the inner, magnetic compass rose on the chart (more on this in a moment). It automatically corrects for variation.

Even if you don't use this rose, correction is a simple matter. The variation for any locality is given on every chart, in degrees. You simply add it or subtract it from a desired course. If it is east, you subtract; if it is west, you add. To remember which is which, memorize this little phrase:

"East is least (subtract); west is best (add)."

When converting a true course to a magnetic course—the only kind you can steer by compass—subtract easterly variation and add westerly.

Example: Seven degrees westerly variation. Chosen true course: 270. Actual magnetic course to steer: 277.

It's that easy.

If you installed your compass properly,

Use chart and course protractor to plot your way from channel marker (right finger) to the islands (at left finger).

you should have no deviation. This second error of the compass is caused by iron objects near the compass. So install it properly and then keep all pocketknives, piles of fish hooks, pliers, exposure meters, beer cans and tools away from it.

Deviation, if recorded, is corrected mathematically the same way as variation. You simply add or subtract deviation to or from the MAGNETIC course to come up with a compass course. Example: true course is 270. VARIATION, seven degrees west. Magnetic course then becomes 277. Deviation on this heading is four degrees west. Final compass course to steer is 281.

That's what the compass says in order for you to head 270 or due west.

This is why it is better to:

1. Use the inner, magnetic compass rose on the chart to plot courses. You can forget variation.

2. Install a compass correctly in the first place. You can then forget deviation.

How do you plot a course? First, you need a chart of your waters—or a map, if an inland lake.

For short runs, and always provided you have no massive amount of variation locally—more than a few degrees—you can pick a course off the chart by eye.

Those vertical lines indicate north-south; the horizontal lines mark east-west. Any diagonal that you visualize would be an intercardinal; any other angle between these would be a combination. Strictly by eye, for short runs, you can select an east-southeast or north-northwest type of course to steer.

With no more than this you can island-hop all over a large bay or sound, always know what island you are passing at any moment, and can always find your way back where you came from. You can also run from buoy to buoy for long distances. Even if you have never been in those waters before. Just let a compass point your way.

For more exact courses, use a device known as a course protractor. It is usually of plastic, has a compass azimuth circle on a base, and a swinging arm rotating around the base. (On some, designed for stowage on small boats, the "arm" is a piece of string.)

To use it, lay the base down on the spot where your boat is located. Swing the arm

Place the center of the protractor on the starting point and swing the arm so it passes through center of the handiest compass rose.

Hold the arm steady and rotate the protractor until the reading on its inner ring matches the reading on the rose's inner ring. When this is done, the protractor is oriented in the same way as the compass rose, but it is at your starting point. Rotate arm so it crosses your destination and reading on protractor will be the course to that point.

so it crosses the nearest compass rose on the chart—right through the center.

Then twist the base about until the readings in degrees on both the base and the compass rose, as indicated by the arm, are identical. Remember to use the INNER, magnetic rose. Then you have no concern about variation of any kind.

You have now "transferred" the compass rose of the chart so your boat is in the center. Now swing that arm to any island, pass, inlet, point, ramp, marina, creek or other object to which you want to run.

Then just read the magnetic course directly from the protractor base, on the side toward the chosen destination. Steer that

Sight ahead to your destination on clear days and check your run against your compass. With a little practice you will gain confidence in the technique.

course, and you'll get where you want to go.

As noted, you have no problem at all with variation. But you could have deviation—which is caused by metallic objects aboard the boat. You can't easily adjust for it, because of a vast difference in the type of error.

Variation, you see, is the same in any given locality for all boats traveling in any direction. Deviation varies from one boat to another, and will vary on a single boat according to which direction it is pointed.

Hence the need for accurate installation.

How do you determine the amount of deviation you may have?

It's simple. Pick out any two major landmarks: two buoys, two channel markers, a tower and a buoy, a cape and a lighthouse—any two charted objects in a line.

Use your course protractor to determine the MAGNETIC direction of the line connecting these two objects. Lay the protractor base on one object on the chart, align it with the inner, magnetic, compass rose. Then swing the arm to the other object. Read—and write down—the MAGNETIC directions, in both ways, of this "range."

Try to set up a roughly north-south range, and an east-west range—approximately.

Then get your boat out and on the range. Line up the two objects, like a gunsight, *with your boat's centerline*. Sight down the middle of the boat.

When on the range, instantly record what your compass reads.

Repeat in the opposite direction, and on the other range, for a total of four readings. Then compare them with your magnetic readings, as taken from the chart, for those ranges.

If you installed your compass properly, there should be no more than a few degrees difference—which, so long as you aren't going on long voyages out of sight of land, can be safely ignored.

If there is substantial deviation, try first to correct it. All but the cheapest compasses have adjusting screws. Use a brass or aluminum screwdriver, or a ten-cent coin. Do NOT use an iron of steel screwdriver!

Get on the range again, and turn the appropriate adjustment screw to *halve* the error. Turn the opposite way, and repeat. Do it again on the other range, both ways. You should be able to reduce deviation to a negligible amount.

For most boatmen owning powered craft of about 20 feet in length or less, it is easy to avoid involvement with compass error. As noted, variation can be corrected by using ONLY the innermost, or magnetic, compass rose when plotting courses. In any event, correction otherwise is simple arithmetic: "East is least and west is best." Subtract easterly variation, add westerly, when going from a true course to magnetic. If a compass is properly installed, deviation is

minimal and can be safely ignored for the average short run. Anyway, steering by deliberate error allows for such minor errata and gets you where you want to go.

But what of the rare boatowner who has —and cannot correct or reduce—serious deviation of five or more degrees, varying up and down from one heading to another?

He has no choice but to make up what is known as a "deviation table." To do this, plot a series of ranges in various directions. Make them roughly (not exactly, there's no need) north-south, east-west, northeast-southwest and southeast-northwest.

Record the MAGNETIC courses of each range in degrees, in both directions. Then "run the ranges," both ways, and note your compass reading each time your boat's centerline comes in line with the range.

Write them all down—magnetic reading first, compass reading next to it. The difference between them is deviation ON THAT HEADING. It is either east or west—just like variation. Which is which? Memorize this little phrase:

"Compass least, error east; compass best, error west."

When the compass reading is "least," or less than the magnetic, the difference between the two readings is easterly deviation.

Example: Magnetic range, 270 degrees. Compass reading when the boat is on the range, 277 degrees. Deviation, seven degrees WEST.

Write down all the magnetic directions, and opposite each write the deviation error, noting it as east or west. Then, when you use your compass to plot a course, correct for variation first—one way or another. Then correct the magnetic course by mathematically applying the deviation figure NEAREST THAT HEADING.

Example: You want to steer due west, true. That's 270 degrees. But you have seven degrees westerly variation in your locality. "West is best" so you add it. Your magnetic direction is now 277. By checking your deviation table you see that you have another seven degrees of westerly DEVIATION when steering anything near this direction. So you add that, too, and steer 284 degrees.

It's really easy—once you know how. But now you can appreciate why it has been suggested numerous times that you install a compass correctly in the first place, in order to forget deviation.

Those catchy little phrases that help us remember things are called mnemonic devices. Here's one that sums up the entire subject of compass course plotting with its corrective factors:

T-V-M-D-C is the story of the compass: True, Variation, Magnetic, Deviation, Compass, or the route you must travel. When going from True to Magnetic to Compass, you correct for variation and deviation aciording to the expression "east is least (subtract) and west is best (add)."

We can't close a discourse on the compass without mentioning bearings. Actually, you've learned a lot about the compass, so the rest is easy.

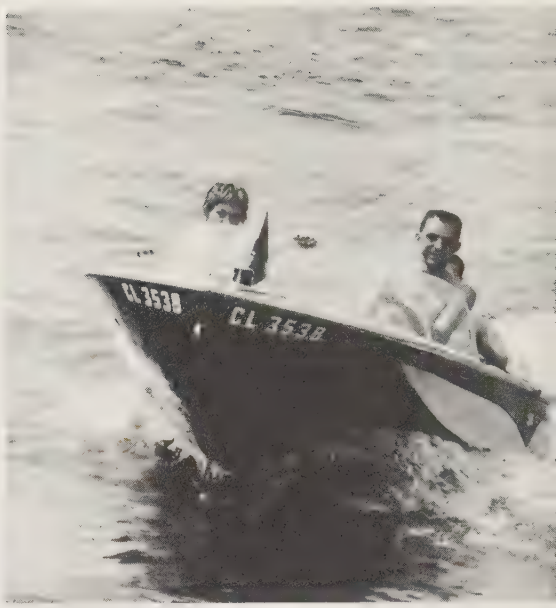
To return to a favorite fishing hole, plot its location by compass bearings. When you are on the spot, sight over your compass at a large landmark. Read the indicated compass direction. Using your course protractor and chart, plot this direction as a line, pencilled outward on the water from the landmark. Repeat with one or more additional landmarks. If you use three, the lines should make a tiny triangle on the location of the fishing hole. If it's a large triangle, you were careless in your work. Do it over.

Get a small triangle and you know you have an accurate set of bearings locating your productive fishing spot. You can return to it time and time again just by running down one of those bearings, following it like it was a compass course, until the other bearings fall into place . J.M.

See also: BOAT HANDLING; BOATING; SAILING.

All about Folk Navigation

When charts and instruments won't tell you everything, use these old-timer's tricks to read the bank and the water surface to find out what the bottom is like



WITH THE RISE OF RADAR and sonar, the more delicate arts of boatmanship have foundered and almost died. Veritable navies of long-gone seamen would turn over in their watery graves if they knew how many boatmen these days have never even learned how to locate the North Star. But folk navigation is about as ripe for a revival as the chain letter. And when this happens it won't be a minute too soon. Today there are millions of boatmen on the nation's waterways, and practically all of them need an IBM computer to get from one end of a harbor to the other. As a weary Coast Guardsman put it, "Half the people we pull off of sand bars get there in the first place because they're so busy watching depth gauges, they forget to watch the water."

Charts and instruments are subject to error and they always seem most susceptible to it when you need them the most. While instruments can do a fair job of telling you where you've been and where you're going, using them to find out where you are is something like trying to figure out exactly how many seconds ago you were born. By the time you do the arithmetic, the answer is obsolete.

For keeping track of where you are while you're there, nothing can compete with educated water-watching.

The surface signs. Folk navigation begins with a look at the land, because the shape of the shore is the key to the shape of the bottom. Whether the water is ocean, lake, or river, the slope of the bank almost always continues under the surface. Banks that rise at a long, slow taper probably slant off at the same continuing line underwater. Steep cliffs or palisades that rise perpendicular from the water probably drop off sharply below it. The growth along river banks is often another telling sign. Where the shore drops steep and clean, you often see big-rooted trees like beeches and sycamores hanging out thickly over the water; willows say "don't come too close—it's shallow."

One of the axioms of folk navigation is, "The deeper the color, the deeper the water." Sand bars ahead give the water a yellowish cast, and light-colored water generally means shallows. Water that's smooth,

level, and a little mottled is usually deep and safe.

When the water is too busy, wind-whipped or turbulent for the color to be clear, keep an eye on the waves. Waves crest and break only over a rising bottom, and where you see crests, you know the water is shallow. Out on the ocean, in a fog after dark, you can navigate a line parallel to the shore by running on the sea-side of the crests, keeping them in sight and in the same relationship to the boat all the time. Near a rocky shoreline on a lake, where the wind ricochets off promontories and headlands, the streaks of foam called spume offer the same guide; spume lines mark off a safe path close to shore.

Now, all this may seem primitive when you remember that there are charts available for most of the navigable waters in and around the U.S.; but the trouble is that you can't always count on the charts. Take the example of a river like the Colorado, which like most of the big water in this country is bisected by a series of hydroelectric dams built to supply power as it's needed. In the daytime, when industry is turned on full blast, there's as much water running through the turbines as they'll take. But at night everything goes off but the late, late show; the penstocks close and the water piles up until morning. Downstream, the water level can drop from two to six feet at night.

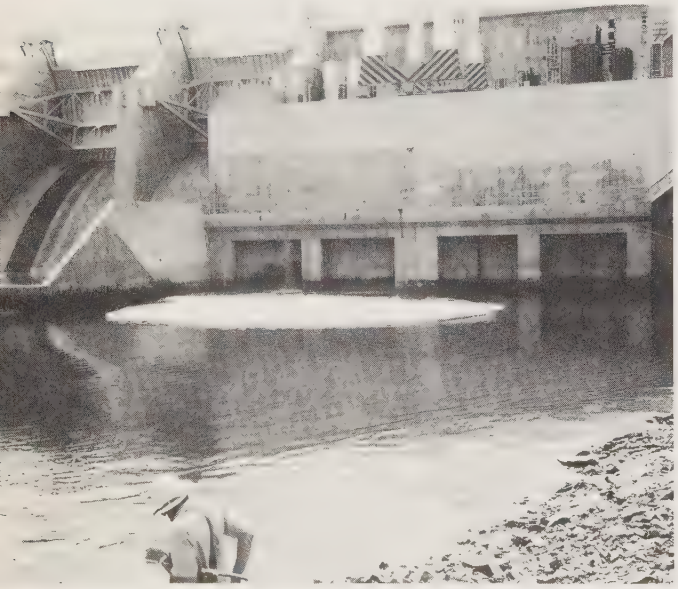
In this kind of situation, charts are likely to lead you nowhere but astray. Sand bars that were eight feet below the surface when you went out in the morning pop up to prop-ruining level by the time you're ready to turn around and go home. So you're forced to rely on animal cunning.

Ozark depth finder. As long as it's light, you can keep track of the bottom by watching the water color. When it turns yellow, you do too; take the coward's way out and lift the prop. But once dusk begins to set in, even observation will do you no good. The only help is boatman's braille. The standard way to feel out a rough bottom is to station a man on the bow with an oar, but this has disadvantages: it's impossible on a one-man run; and it contains the danger of making a two-man crew a one-man crew, suddenly. A better way is to cut a six or eight-foot willow pole and shove it through the bow-eye, butt down. You should have about 18 or 20 inches extending below the boat's keel line and several feet of whippy tip sticking up above the bow deck. Then run a line from the tip back to your hand. Your position is pretty much like that of a bream caught on a cane pole and line. As the boat moves forward, the willow butt acts as a feeler that's operating a full boat-length ahead of the prop. When the bottom comes up, the butt hits, the tip of the pole tugs forward, and you feel it on the line. Among folk boatmen, this is known as the Ozark depth finder.

Checking the current. The boat is blundering through a blind fog. All the landmarks that use to be, aren't. The compass is dutifully pointing north, but that's no help: this river takes so many turns that the skipper doesn't know whether he wants to go north or south, All that he does know is that when he left his home port he went downstream. To get back, he's going to have to go upstream, but the current is sluggish and there's a confusing crosswind. It's not immediately apparent which way is up.

Fortunately, the skipper is a folk navigator. He knows that fog always moves toward the shore, so he moves with it, cautiously looking for shallows and water growth. In a few minutes he sees a clump of water weeds. He leans over and peers at them. Half-wrapped around the stalks, like tired letter U's, are some limp straggles of dead water moss. Their ends point downstream; the other way, obviously, is up. A few feet away a bullfrog plops into the water and confirms the diagnosis. As any folk nav-

Usually the bottom is like the bank. When the bank has a shallow slope, so does the bottom. When the bank is steep, the water gains depth abruptly. But, be careful. Terrain like this, for example, could shelve away from the shore at fairly shallow depths.



Charts can be deceptive on rivers that form parts of hydroelectric power systems because water levels fluctuate with power use. Depths can vary from one to eight feet in a day.

igator knows, they always head into the current . . . just as fish at rest face into the current with mouths open to catch anything appetizing that might happen to drift downstream. For final confirmation, the folk navigator could drop a single bow anchor. The boat would swing downcurrent, unless the crosswind was strong enough to confuse the issue, and even then the bowline, reacting to the underwater pressure of the current rather than the surface pressure of the wind, would curve in the downstream direction.

A sharp eye for the effects of currents and winds can not only get you out of trouble but keep you out of it as well. Suppose you're out on a big lake when a strong wind comes up and clouds that looked friendly suddenly seem hostile. You're a long way from shore, but there's a little island ahead, so you mosey over to take a look at it. If you're the kind of a boater who reads signs instead of slide rules, the first thing you check is the shoreline. Plenty of scattered debris on the upwind side means this wind is probably a common local phenomenon—and prevailing winds, you know, seldom bring storms. Probably safe to stay out. Now, if the upwind side of the island is clean, you'd reason that the wind is coming from the direction opposite to the prevailing winds—that it's the kind of reversed wind that often begins in a storm. You'd hustle over to the lee side of the island to sit it out. You'd hustle even harder if the upwind side is clean close to the shoreline, but littered way up on the beach; this would tell you that winds and high waves seldom attack on this side, but when they do, they're real pounders.

Navigation doesn't just mean figuring how to get to there from here. It also means handling the conditions that you meet between you're going and where you are. "Conditions" here usually means waves.

There are as many different kinds of waves as there are different kinds of water —and as many ways of handling them. Take, for example, a relatively big, relatively shallow lake, with water that under the stress of long-driven waves. It tends to produce a choppy, fast-breaking wave that

mounts in size as it approaches the shore over the long, gradually rising bottom. All the power of the wave is concentrated at the top, because there's no cushion of deep water to absorb it. When waves like this are running parallel to the direction you want to take, the apparently easy way—running in the troughs—is the line of most resistance. For the safest, driest ride, the best route is a tight-tacked zigzag. The zig gives you a slanting attack into each wave—one that's eased by a light hand on the throttle—then you come over the top, tack hard, and zag your way down the other side.

River water can be just as tricky in its own way. Many rivers don't have enough surface to set up wind-driven waves of any size, but they have big waves anyhow—the kind made by obstructions or irregularities in the bottom. Here the wave is stationary. The main body of the water moves through it. A boat nosing into it gets the full up-and-down pressure of the wave, and it may wind up in a side-pressuring whirlpool on the downstream side that can send it into the next wave broadside. The man with an instinct for water rides up the wave, cuts the throttle as the boat edges over the top, then uses just enough power to take him across the trough and put him in the best position for the next wave.

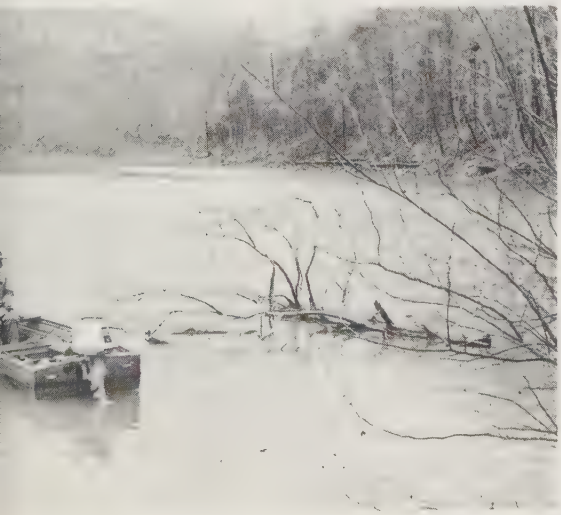
Sheer size isn't the only specification that can make a wave troublesome. There is also the dimension known as fetch—the distance between the crests of the waves. If it happens to match the length of your boat, it's a custom-tailored plague. The boat comes down the side of one wave, bow down. The next wave lifts the nose and leaves the boat straddling the trough, with nothing supporting it through the center but thin air, which is not likely to be enough to keep it from cracking.

Some boatmen handle the problem of boat-length fetch by taking the long, zigzag way home, as described above. Others hit the waves more or less head-on and rely on sensitive throttle-juggling to minimize splashing and pounding. It's a matter of taste—and seat-of-the-pants instinct.

As a matter of fact, right there lies the whole secret of folk navigation. But in today's soft foam-and-vinyl cockpits, seat-of-the-pants instinct often gets lost in the lap of luxury. And the comfort of it all tends to create a sort of seagoing highway hypnosis: the eye sees the scene but doesn't register the details. So folk navigation goes by the board—and with it, the best part of boating: seeing, knowing, and understanding what's going on in the water around you. J.S.

See also: BOAT HANDLING; BOATING.

Learn to read the shoreline for signs of what the river or lake bottom is like.



Debris washed ashore can provide information about prevailing winds and storm winds.

Noise and Your Homesite

The screech of a landing jet or the roar of a truck climbing a hill can destroy your tranquility, disrupt your sleep and depress the value of your property. Use these guides to evaluate the environment for noise pollution before you buy or build

IF YOU HAVE DONE any traveling at all, you have undoubtedly experienced the frustration of checking into a seemingly quiet motel only to discover, too late, that restful sleep is either impossible or frequently interrupted by the roar of nearby trains, the groaning of trailer trucks struggling up a long highway grade, the scream of jet planes leaving an airport that someone built next to the motel while you were having dinner, or perhaps at least the unmuffled snoring of a Canadian lumberjack who checked into the next motel unit at two in the morning.

Somehow we all manage to survive these aggravating experiences. But suppose you run into similar problems after you move into your brand new dream home? You can't just pack up and move on the next morning. Stuck with the noise pollution, you will have to learn to live with it. Maybe you can, and maybe you can't. But why take the chance when noise can be adequately controlled in your new home?

noise, auto: see repairs, automobile
nursery furniture: see furniture, children's
nursery plants: see gardening
nutrients, plant: see fertilizers
ohmmeter: see electronics

When you shop for a new home, or for a lot on which to build your home, evaluate carefully all the external sources of noise pollution, including all major highways, railroads, airports, manufacturing plants, commercial waterways. When you look at a factory built home, see whether the noisy and quiet zones of the home have been adequately isolated from each other by proper floor planning and the use of soundproof walls, floors and ceilings where they are really needed. If the home is to be custom built, analyze your own living habits and advise your builder what sound-control features are important to you. Extra dollars spent on noise control will buy more lasting living comfort than the same dollars spent on fancy new furniture or other luxury features.

Outside noises are, in a very real sense, more troublesome than those that are generated inside the home. Inside, noise problems not anticipated earlier often can be minimized through remodeling, and you can, when things get really rough, tell the kids to tone it down. But it's no use shouting at trucks, trains or jet planes.

The only way to cope with such nerve-eroding outside noises is to do your best to avoid living in a noisy area. But here's the problem: a neighborhood that seems quite in the daytime may seem to be far noisier at night. Paradoxically, this is because the overall background noise level decreases at night, thus making the persistent noises more obvious and annoying. Meaningful noise pollution analysis is not difficult, and it can be done without messing around with hard-to-understand decibel measurements. A practical analysis requires only a modest investment of time and effort, but the returns in terms of long-term living comfort can be immeasurable. Here's how to go about it.

Road noises. To evaluate your homesite's exposure to vehicular noises you must consider all major roads within 1000 feet. If you are really in the boondocks, it may be very obvious that you have no highway noise problems to worry about—unless the city or state has plans to put in new highways during the years ahead. Check your local or state highway planning department to make sure that five or ten years from now you will not have a superhighway in your back yard. This has happened to many unhappy people, in many places.

If you shop for a suburban building site —especially during the summer months— study maps and get to know the neighborhood through walking tours to make sure you know what lies behind that wooded area, for example. You may be surprised that the superhighway curves around much closer to your potential homesite than you thought. During the summer, the highway noises may be considerably muffled by the leaves on trees and shrubbery. When the leaves fall, or even if the wind shifts direction, your site may become much noisier.

If there are several major roads within 1000 feet of your site, a careful study is in order. Be sure to consider all noise factors including rush hour traffic, prevailing vehicle speeds on different roads, what kinds of vehicles use the roads (especially trucks and buses), whether there are nearby stop signs or stop lights, and whether there are road gradients of three percent or more (very important if there is much truck traffic).

A complete analysis under such circumstances is fairly complicated, but it need *not* be unduly difficult. The procedure is a bit too lengthy to detail here, so you are advised to acquire a U.S. Department of Housing and Urban Development (HUD) booklet titled *HUD Noise Assessment Guidelines.* It includes information about analyzing railroad and airport noise as well as roadway noises.

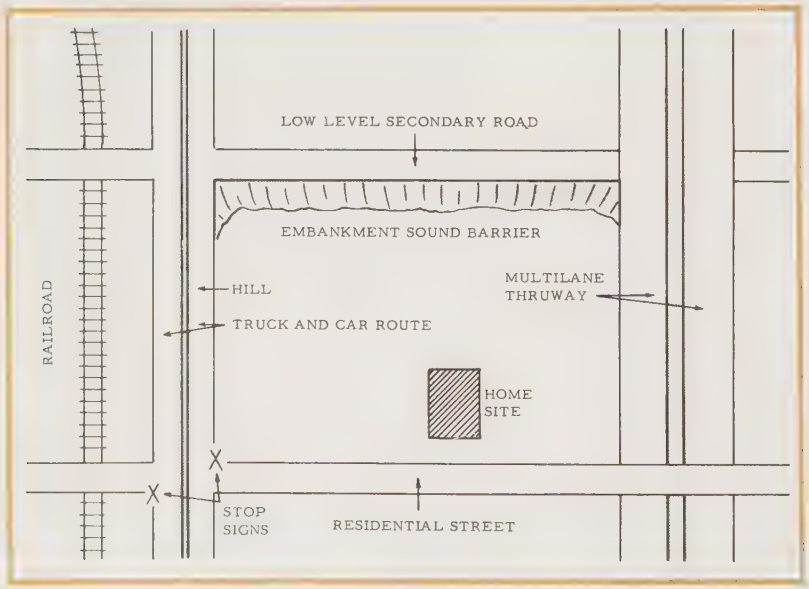
Airport noises. During the daytime you may be able to blank out the sounds of aircraft landing and taking off at a nearby

airport. But in the evening you may be distressed to see your TV program go to pieces every 10 minutes when another jet plane swoops by. And you may find it necessary to use ear plugs when you go to bed. Even if you think you can easily tolerate the current air traffic in your area, will you be able to do so if runways are changed or extended in the future? Learn all you can about possible future airport "modernization."

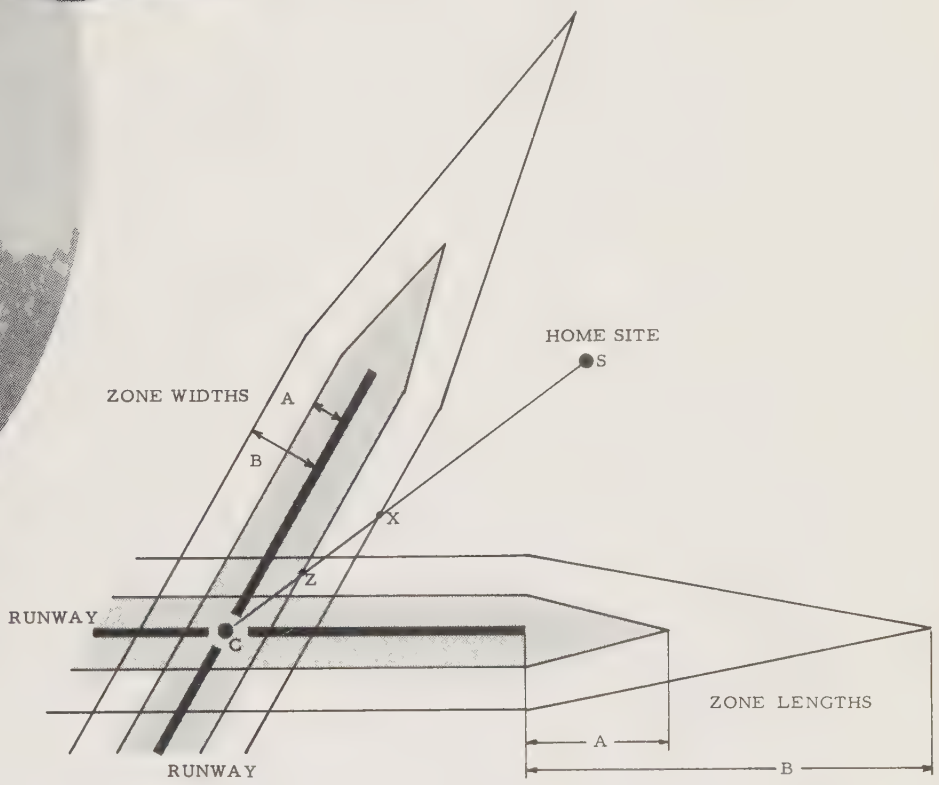
You should consider all commercial and military airports within a 15 mile radius of your location. If possible, obtain either of two types of *noise contour charts* for each airport. Airport administration people can tell where you can obtain a *Noise Exposure Forecast* (NEF) or a *Composite Noise Rating* (CNR).

If such charts are not available, you can easily prepare your own charts which will

Many factors affect road and rail noises. Hills and stop signs increase traffic noise levels. Barriers, such as large buildings or steep embankments, reduce them. In analyzing present and future traffic patterns, consider vehicle types, their speeds and line-of-sight distance from road to home.



be accurate enough for your purposes. First ask the FAA Control Tower or Airport Operator for information about (1) the number of jet operations between 10 PM and 7 AM (the nighttime period), (2) the number of operations between 7 AM and 10 PM (daytime), and (3) the location and takeoff and landing patterns in each direction, of the major runways. Also ob-



Effective Number of Flight Operations per 24 hours	Zone Widths in Miles		Zone Lengths in Miles	
	A	B	A	B
0 - 50	0	1/5	0	1
51 - 500	1/5	1/2	1	3
501 - 1300	2/5	1-1/2	2-1/2	6
Over 1300 or *any* supersonic jet operations	3/5	2	4	10

To determine acceptability of plane noise for homesite, draw A and B runway noise zones onto local map showing your site and any nearby airport. Use appropriate zone lengths and widths provided, laid out to the scale to which your map is drawn. Connect site with center of runway activity. If the distance SX is greater than XZ (between the zone boundaries along line SC) the noise level will be "clearly acceptable." Text explains how to figure effective flight operations per 24 hours.

RATINGS OF SITE EXPOSURES TO RAILWAY NOISES

NOISE LEVEL RATING		NUMBER OF NIGHTTIME TRAIN OPERATIONS			
Indoors	**Outdoors**	**10 or More**	**6-9**	**3-5**	**1-2**
GOOD TO EXCELLENT	GOOD TO EXCELLENT	Over 3000 ft.	Over 2500 ft.	Over 1765 ft.	Over 910 ft.
ACCEPTABLE	FAIR	601-3000	500-2500	354-1765	181-910
POOR	TOLERABLE WITH SOUND BARRIERS	101-600	84-499	60-353	31-180
INTOLERABLE	INTOLERABLE	Under 100	Under 83	Under 59	Under 30
GOOD TO EXCELLENT	GOOD TO EXCELLENT	Over 500 ft.	Over 417 ft.	Over 295 ft.	Over 151 ft.
ACCEPTABLE	FAIR	101-500	84-417	60-295	31-151
POOR	TOLERABLE WITH SOUND BARRIERS	51-100	43-83	30-59	16-30
INTOLERABLE	INTOLERABLE	Under 50	Under 42	Under 29	Under 15

▲ *Upper half of table rates railroad noises where there are no sound barries between the railroad and homesite. Lower half applies where there are effective noise shields such as large buildings or natural land formations between the railroad and site. Sound barriers in "Outdoors" column are in-yard baffles—fences, shrubbery. Nightime trains: 10 PM to 7 AM.*

tain a map of the area showing clearly the airport layout and your homesite.

Use the information provided in the aircraft noise diagram to lay out two "noisc contours" for each runway shown on your map. Even better, use a scaled-up drawing of the airport and its surrounding area. First note that the contours are based on the number of effective flight operations per 24 hours, not on the actual numerical number. To determine the effective number of operations, simply multiply the actual number of nighttime operations by 17 and add the number of daytime flights to this product.

Let's assume that there are about 300 effective operations per 24 hours at your local airport. The table indicates zone widths of ⅕ and ½ miles. Using the distance scale on your map draw parallel lines on both sides of all major runways, locating one set ⅕ mile from each runway, and the second set ½ mile away. Note that each noise zone stretches out to a point in the direction of the runway. In this example zone lengths A and B are 1 and 3 miles respectively. Draw them in.

Now draw a line from your homesite to the center of airport runway activity. This line cuts across the noise contour lines at X and Z. If the distance XS (your site to the nearest contour) is greater than distance XZ (one contour to the next), the aircraft noise level at your homesite will be clearly acceptable. The shorter distance XS is in relation to XZ, the more you will be troubled by aircraft noises. If your site is inside the noise contour lines, go look for another homesite!

Railway noises. To evaluate your homesite's exposure to railway noises, you must take into consideration all railroads and rapid transit systems within 3000 feet of your property. The site-to-railroad mea-

surements are most easily made using a detailed area map. But you should make a personal visual examination of the intervening area to see if there are any man-made or natural sound baffles—for example, large buildings or such terrain features as embankments or hills. The shielding by such obstructions must be *complete;* if you spot any gaps, use *only* the upper half of the railway noise table.

Bear in mind that if you plan to build a multi-story home, the upper floors may not be noise shielded by any existing barriers even if the lower levels are protected.

To judge how troublesome railroad noises will be, you need only know the distance from your homesite to the railroad, and the number of nighttime train operations (10 PM to 7 AM). The theory is that if you can tolerate the noise when trying to sleep, you can put up with it during the daytime.

The *Good to Excellent* rating implies that both indoor and outdoor environments are essentially free of objectionable railroad noise. *Acceptable* means that you must be concerned about the noise, but you can probably cope with it, even when sleeping, if your home is constructed in conventional manner. *Fair* means that your out-

door area will be reasonably pleasant for recreation and play but not necessarily for daytime napping or heavy-thinking activities. A *Poor* rating is a warning that you will have to spend extra money on sound-absorbing walls to make your home livable. Under these same conditions your outdoor area can usually be made *Tolerable* if you erect effective sound barriers such as thick fences or dense shrubbery, preferably evergreens. An *Intolerable* rating indicates that soundproofing your home would be prohibitively costly, and that your outdoor space will be a noise disaster area in terms of enjoyment.

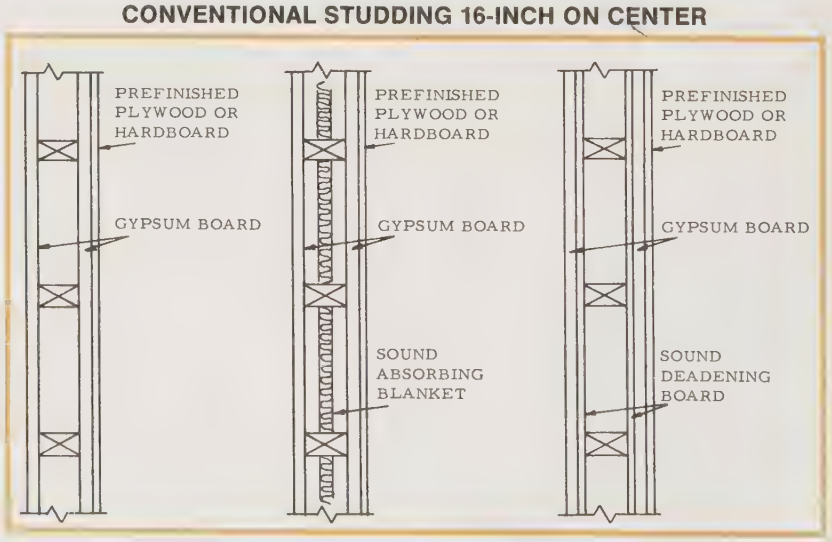
Walk-away test. The *HUD Noise Assessment Guidelines* publication already mentioned recommends that you perform an on-site "walk-away" test if your homesite is exposed to more than one questionable source of noise pollution.

All you do is stand in the middle of your lot and read from a book or newspaper (normal voice, and reading unfamiliar material) while a second person (having normal hearing ability) slowly backs away while stretching out a 100-ft. tape measure. When the listener can grasp only one or two words every ten seconds of reading, note the distance between reader and listener. Repeat the test a number of times, switching roles, and average the results. Repeat the tests at other hours of the day, and on different days of the week. Try to make the tests during normal noisy periods. Average all distance measurements.

If the averaged distance is more than 70 feet, the location is deemed essentially free of objectionable noise pollution. If the distance is between 26 and 70 feet, the location is normally acceptable, but not ideal. If the distance is between 7 and 25 feet, your home will require special soundproofing and your outdoor living areas should be sound-baffled. If the listener must stand closer than 7 feet from the reader, go look for another lot!

Bear in mind that where there are many trees and much shrubbery, a summertime walk-away test may not accurately reflect noise conditions during the fall, winter and early spring.

Inside noises. In a well-planned home, closets and hallways are used effectively as sound barriers between rooms, and the sleeping quarters are placed as far as possible from noisy activities areas. However, these basic anti-noise measures rarely suf-



Ordinary partitions (left), are very poor sound absorbers. There's improvement in placing sound-absorbing blanket material between studs (middle). Better is special sound-deadening board between studs and gypsum layers (far right).

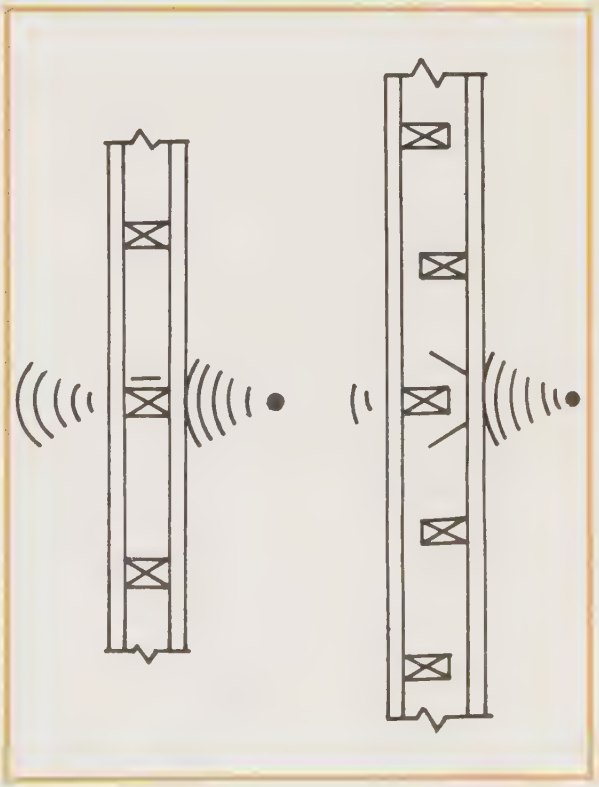
TRANSMISSION TABLE

Wood Studs (Normal)	X		X				X		X		X	X	X
Wood Studs (Staggered)					X								
Metal Studs		X		X		X		X		X			
1/2" Gypsum Wallboard	4				2			2	2	2			
5/8" Gypsum Wallboard			2	2		2	2				2*	2	
1/4" Hardboard	2	1	2	2	2	2	2	2	2	2	2	2	2
1/2" Mineral Fiber Sound-Deadening Bd.								1					
1-1/2" 3-PCF Sound Blanket	X	X		X		X	X	X	X	X			
2" Mineral Wool Blanket					X								
3" Mineral Wool Blanket			X										
1/2" Wall Bd. Spacer Strips							2						
Resilient Channels	1		2						1				
Masonry Blocks (Lt. Wt.)		X											
Vapor Barrier			X		X								
Sound Transmission Classic (STC)	58	57	56	55	54	53	53	53	52	51	50	44	36
Relative Cost Index	189	216	156	152	182	151	168	163	154	149	137	137	104

Materials used (X) or number of layers of each material used. *Gypsum wallboard is on *top* of hardboard panels.

Compared in terms of Sound Transmission Class (STC), evaluations are based on prefinished hardboard panels using varied construction and sound-absorbing materials. Partition of one hardboard panel fastened to each side of wood stud partition transmits most sound as indicated by lowest STC number. Cost index figures show that construction costs roughly parallel increases in sound proofing.

fice. If the rumpus or family room is next to or underneath the living room, the separating partition or floor should be soundproofed; otherwise neither room can be enjoyed to its full potential. If the recreation room is adjacent to, or beneath bed-



Even sound-absorbing blankets won't completely soundproof conventional stud construction (left); studs transmit sound from one wall to another. Staggered stud partition (at right) is better as there is no physical linkage. Sound-absorbing blanket can easily be woven into this type wall. Sound-deadening board material under the gypsum would improve either.

rooms, soundproofing is even more important. Watching TV or simply relaxing in the living room is difficult if noisy appliances in an adjacent kitchen can be heard too clearly. If bedrooms are not separated from each other by closets or hallways, the walls should be soundproofed.

A complete review of all modern soundproofing techniques is beyond the scope of this article, so consult your library for information, and discuss your noise control problem with your architect and/or building contractor. Meanwhile, here are a few general guidelines.

Do not expect acoustic tile on a basement recreation room ceiling to keep sounds out of the room above. They are not intended for that purpose; the tile will merely minimize noise in the room where it is used. To create an effective barrier against sound transmission to other rooms, use sound-absorbing blanket material between the ceiling tile and the floor above. Float the ceiling tile (using special hangers) instead of nailing directly to slats attached to joists. The use of ½-inch thick fibrous sound-deadening board between the rough and finished floors of the room above is excellent. Thick carpets and resilient pads are a big help.

Partitions can be soundproofed to varying degrees depending on the materials used, and how the materials are utilized. The transmission table compares the sound-blocking characteristics of different partition constructions that include the use of prefinished hardboards. Note, for example, when hardboard is placed atop gypsum board on both sides of a partition, the STC value is 44; but if the hardboard is placed underneath the gypsum board, a higher rating of 50 indicates improved soundproofing. Also note that a partition made of lightweight masonry blocks has one of the highest ratings. This chart is used only for illustrative purposes, so bear in mind that other types of partition construction can be equally good. In fact, one of the best sound barriers, commensurate with reasonable cost, is one in which gypsum board is cemented onto underlayers of ½-inch wallboard made especially for sound insulation.

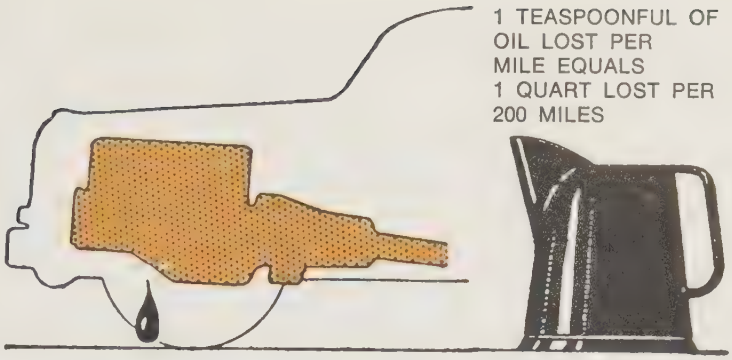
The accompanying drawing shows why staggered studs help materially to reduce sound transmission through partitions. In a conventional wall, vibrations produced on one wall are transmitted to the opposing wall through the studs. If the studs are staggered so that there is no direct physical connection between the two walls, sound transmission is greatly reduced. So if you want the very best in soundproofing, pick the right materials, use staggered studs, and apply sound-absorbing blankets inside the wall and sound-deadening board as sublayers. But bear in mind that even such elaborate efforts will be thwarted if there are any *gaps* in the soundproofed area. For instance, a loose-fitting, hollow-core door in the partition would largely nullify the best efforts to defeat irritating noise.

Existing partitions can be made more soundproof, without tearing them down, by adding a second wall over the first. This will not greatly increase the thickness of the wall because the sound-deadening board and overlying gypsum board can be held in place by means of relatively narrow metal studs.

Before you install any basement ceilings, separate all water pipes and heating system pipes from direct contact with structural members of the house by means of resilient pads. You will thus easily eliminate a lot of annoying groaning and banging of pipes. Also, support motor driven appliances on resilient pads.

Admittedly, soundproofing a home properly requires a lot of thought and planning. But it is time well-spent because a noisy house is not really a home. J.H.

See also: HOME OWNERSHIP; KITCHENS; MOBILE HOMES; SITE SELECTION.



How a comparatively small amount of leakage will add up on a trip of several hundred miles.

How to Stop Engine Oil Loss

Before you start thinking about an expensive replacement of piston rings, take a look at the many other factors that cause your car's engine to lose oil

YOU'VE HEARD THE SUMMER month vacationist say the trip was fine but that he "used a lot of oil," but, did he? Perhaps instead of using he was losing oil; there is a difference. You've seen those familiar dark streaks stretching endlessly along both sides of concrete highways—they are mute evidence of precious engine oil relentlessly dropped from motor vehicles.

How much can plain everyday oil leakage amount to? If your engine has an external leak which lets a teaspoonful of oil drip from the engine every mile, you'll lose nearly a quart of oil every 200 miles of travel. Of course, every normal engine uses oil when operating because some oil naturally is consumed in the combustion process. If this were not so, you wouldn't have to add a quart now and then to bring the crankcase oil level to normal. And, like excessive fuel consumption that goes along with sustained high speed driving, oil consumption, too, goes up with high speeds.

But there is such a thing as excessive oil consumption at normal driving speeds. Sometimes the cause may be hard to diagnose, but like a headache, excessive engine oil consumption tells you something is wrong somewhere.

If your engine has a lot of miles on it and the oil burning has been gradually becoming worse, the only cure is to go inside the engine.

Interestingly enough, worn rings are not the most common cause of high-mileage oil consumption. The ring manufacturers have done an excellent job of making rings that last, and their oil control rings are singularly good.

A more likely cause of high mileage oil burning is worn valve guides or damaged valve stem seals. The seals can be replaced with special tools without even pulling the cylinder head. Valve guide replacement requires pulling the head, but even that is not an extremely difficult job.

If you suspect your engine may be leaking oil, start your investigation by taking a look at your garage floor or wherever you normally park the car. The familiar "gooey" spot on the floor under the engine is a dead give-away of dripping oil. A

oil filters: see filters
oil heating systems: see fuels
oil stains: see finishing, wood
open-end doweling: see dowels
optical bench: see science projects

good test is to spread some clean newspapers on the floor under the engine. Then run the engine at a speed substantially above idling. Allow the engine to run long enough to bring it up to idling temperature and for 5 or 10 minutes thereafter. If oil drips on the paper, get under the car and check where it is coming from. Remember that though the oil drops straight downwards with the car at rest, the source of leakage actually may be farther away with the oil creeping along inside the engine until it finds a convenient spot from which to drip. Also remember that the car's forward motion often makes excess oil show up where a leak is actually not occurring. If you suspect external oil leakage, look for "oil washed" areas on the engine; such areas are evidence of leakage ahead of the washed areas. While excessive oil consumption also may take place inside the engine, let's first trouble-shoot and correct the external leaks.

Very often just tightening a joint, installing a new gasket or tightening the oil pan drain plug, stops external leaks.

Oil loss can also be caused by too much pressure in the engine crankcase.

On older cars (1962 and earlier), crankcase pressure and turbulence (caused by wear of the piston rings, which allow exhaust and unburned gases to leak into the crankcase), would break the oil up into droplets, and these droplets would blow out the crankcase ventilating tube.

Since the introduction of positive crankcase ventilation, the oil droplets-laden gases now are pulled out of the crankcase and dumped into the intake manifold, where they go into the combustion chamber for burning. In high-speed driving, the engine will suddenly start to burn oil.

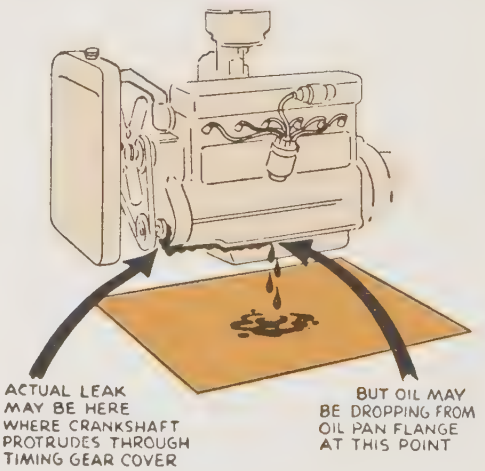
The positive crankcase ventilation system also can cause oil leaks. If the PCV valve is partly or fully clogged, the gases cannot escape. Crankcase pressure builds up and when it is very high, it can create leaks through any weak spots in the oil pan and other engine gaskets, including fuel pump, rocker cover, tappet cover, intake manifold (on some cars), and timing chain.

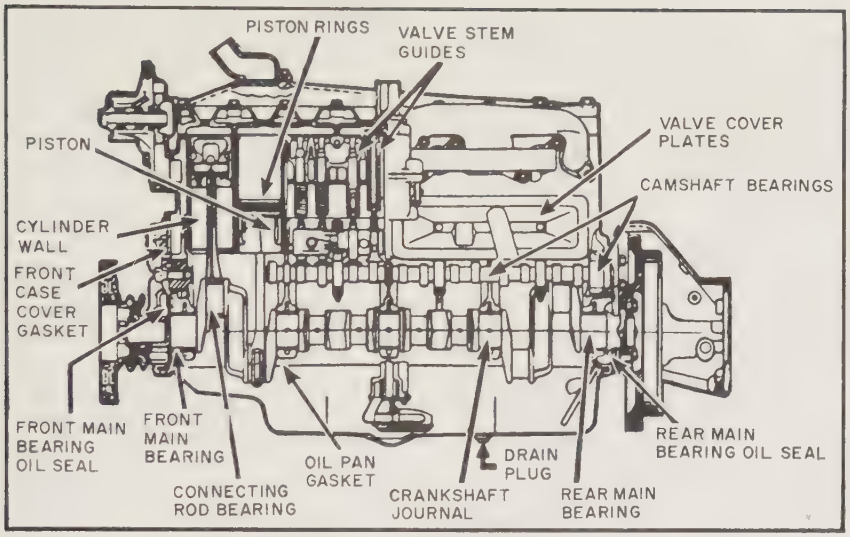
An increasingly common cause of oil burning on GM and Ford products creates an unusual mystery. The smoke is pouring out the tailpipe, but the engine dipstick doesn't seem to be showing any oil loss. In this case, check the transmission oil level, you will find it down. How can transmission oil burn in the engine? Very simple, on automatic transmissions with vacuum modulators.

The vacuum modulator is a transmission device that is connected by a hose to the engine's intake manifold. It contains a diaphragm that helps regulate transmission shifting according to changes in engine manifold vacuum. If the modulator diaphragm cracks or becomes porous, the intake manifold vacuum draws transmission oil up through the hose into the engine.

The switch to electric windshield wipers eliminated the combination fuel-vacuum booster pump that was used on most cars

If you suspect your engine of leaking oil externally, spread clean paper under the engine and allow it to run awhile. Then watch where the oil is dripping to localize leakage source.


ACTUAL LEAK MAY BE HERE WHERE CRANKSHAFT PROTRUDES THROUGH TIMING GEAR COVER
BUT OIL MAY BE DROPPING FROM OIL PAN FLANGE AT THIS POINT



This illustration shows the engine parts involved in both internal and external oil leaks. Loose joints on such parts as the oil pan and front end timing gear cover do not allow gaskets to seal tightly. Internally, such worn parts as cylinders, rings and bearings, can cause excessive oil consumption.

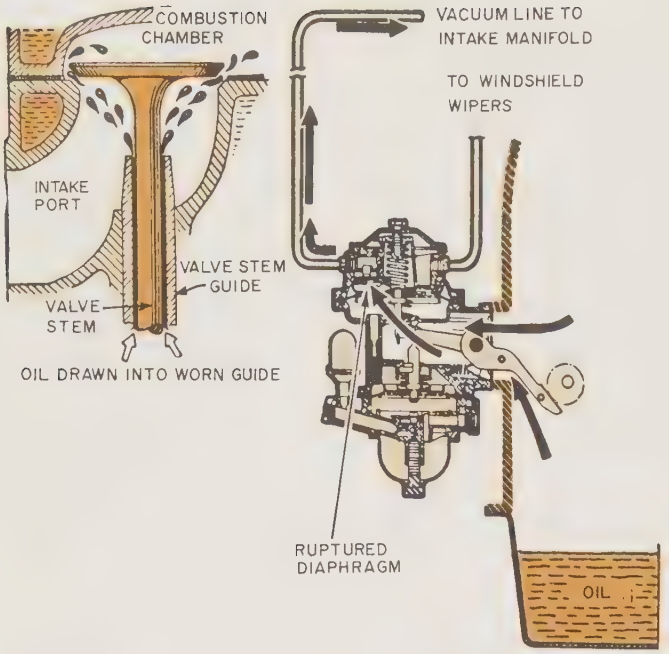
with vacuum windshield wipers. And this booster pump was responsible for many cases of sudden high oil consumption. The pump was operated by intake manifold vacuum, and if its diaphragm leaked, the vacuum would draw oil from the engine block, into which the pump was bolted, up into the manifold. Only a few cars use vacuum wipers today, but you may have an older car that also has them, and you should not forget this possibility.

Checking for leakage. To check vacuum pump diaphragm leakage (indicated by sluggish windshield wiper action when the engine is accelerated), have the wiper in operation and disconnect the vacuum pipe at the manifold. Then hold a piece of clean paper near the open end of the pipe. If you get an oily discharge, it shows that oil is passing through the vacuum pump requiring replacement of the diaphragm.

Other reasons why your engine may be using or losing too much oil are: piston rings with too little "end" or "gap" clearance; rings installed upside down in grooves; wrong type rings for the engine; distorted cylinders caused by unequal tightening of cylinder head stud nuts; connecting rods bent or twisted; late valve timing; too much oil pump pressure (can be corrected on some engines by regulating oil pressure relief valve where such a valve is fitted); dirty oil; clogged oil passages; air-fuel mixture too lean (engine may overheat causing rings to stick or break); dirty cooling system, causing local hot spots, distortion and overheating of the engine. In some cases the remedies are obvious; in others, it means a tear-down and rebuild job which should be done by a well-equipped shop.

The more mileage on the engine, the more likely it is to use more and more oil. It usually will take more than just a "ring job" to bring back normal conditions with normal oil consumption. Wear is usually distributed over the entire engine so that when cylinders have to be reconditioned it's safe to say the valves, bearings, timing chain or gear, camshaft and crankshaft need reconditioning or replacement. The popularity in recent years of "rebuilt" or "exchange" engines testifies to the fact that fixing only part of the job certainly won't overcome high oil consumption in a worn engine. Oil consumption also goes up with

How to Stop Engine Oil Loss



Excessive wear of valve stems and their guides causes oil to be drawn into combustion chambers where it is burned with the air-fuel mixture, causing the blue smoke from the exhaust. Worn piston rings also cause smoke.

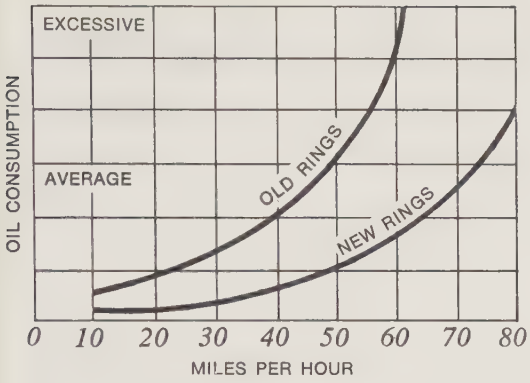
high road speeds; as is true with gasoline, moderate speeds will save you money by using less oil.

Although rings have dropped to near the bottom of the list as a cause of engine oil burning, they still must not be ignored. Rings have a tough job to do in any engine. They must act as a guide for the piston, must conform to the cylinder walls, and seal against compression and combustion pressures, besides keeping the correct amount of oil on the cylinder walls. They have to constantly battle other hardships like oil dilution, cold weather starting, gum and foreign matter, all of which induce wear or cause sticking and breakage. Worn, broken, or sticking rings (rings that stick in the grooves of the pistons, because of gum, carbon, etc.), when removed and replaced with a new set of rings, often bring oil consumption back to normal.

But here is a point to watch. Blue smoke blowing from the exhaust pipe doesn't always mean the rings are to blame. Perhaps the rings are in fairly good shape but not able to handle the excessive oil "throw-off" from the bearings. Remember that bearings, too, have a lot to do with high oil consumption. Engines are fitted with piston rings, known as "oil rings," which are there to control the amount of oil for the cylinder walls. The oil rings scrape excess oil back to the crankcase, but when excessive bearing clearance allows too much oil to be thrown on the cylinder walls, the oil rings just can't handle the great volume of oil.

Therefore, when your engine uses a lot of oil and the trouble is traced to "rings," you are in for a job of (a) replacing the old rings with new, or (b) reconditioning the cylinders, fitting new pistons, pins, rings, main and connecting rod bearings. Along with this a "valve job" will be done because when an engine is "down" for major work on cylinders, pistons and bearings, the valves are sure to need replacement or reconditioning.

Many times, the effect of worn rings will be exaggerated. Worn compression rings and low compression readings do not mean that oil consumption must be high, or that



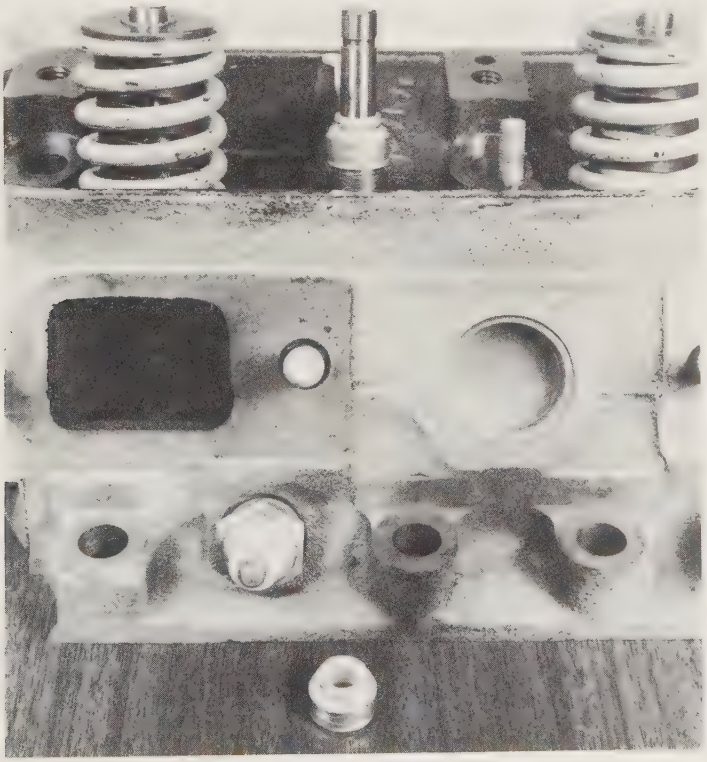
Curves showing how oil consumption goes up with high road speeds. Consumption is greater with old or worn piston rings.

the rings are the major cause of the problem.

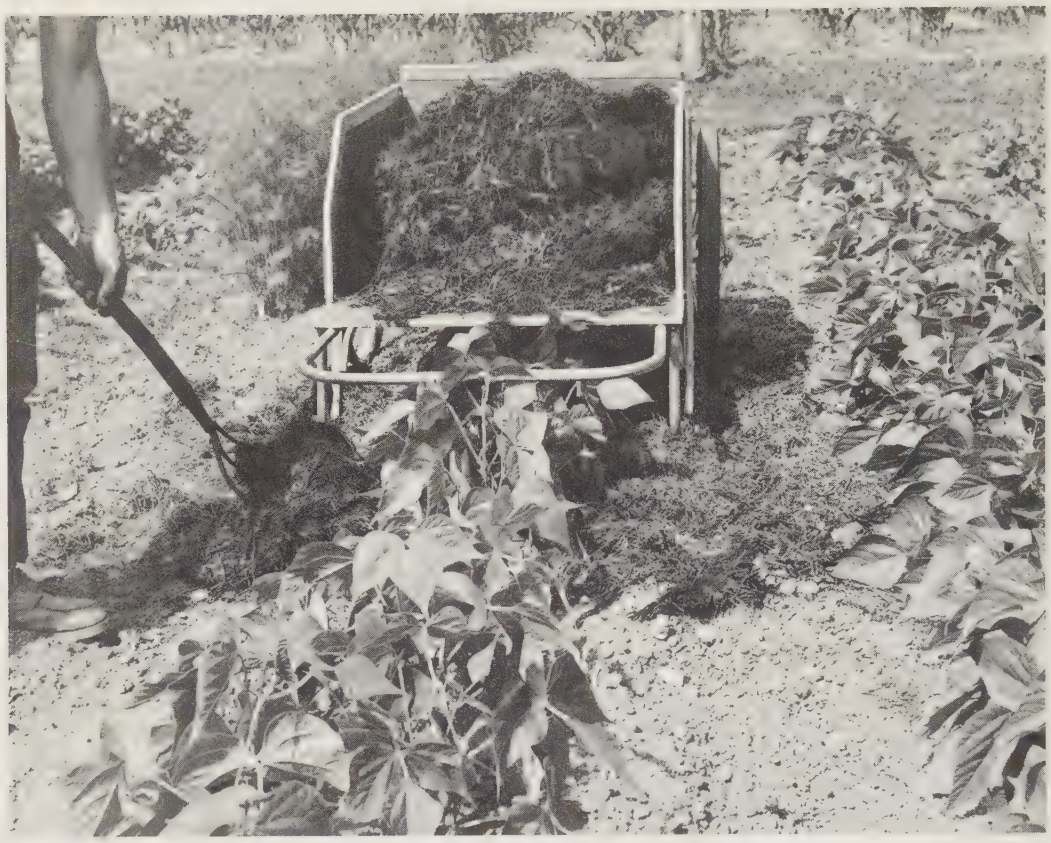
Often, repairing a few minor leaks, replacing valve stem seals with new, improved seals, and servicing the positive crankcase ventilation system will restore oil mileage to an acceptable level.

Oil additives. Engine oil additives have become very popular in recent years as a performance improver. These very thick lubricants actually increase the oil's ability to resist thinning out as the engine warms up. As such, they can be helpful in reducing oil burning by preventing the oil from becoming thin enough to slip past worn rings and through worn valve guides. In conjunction with other measures, they can help keep oil mileage at reasonable levels without the expense of an overhaul, which on an older car may not be economically justifiable. P.W.

See also: BEARING; ENGINE; PARTS REPLACEMENT, ENGINE; TRANSMISSION, AUTO.



Because modern engines breathe so deeply, the intake valve guide, when worn, is a major cause of oil consumption. Improved seals, such as the spring-loaded teflon type illustrated, can be installed to prevent oil loss from this problem.



Luxuriant healthy growth is achieved by recycling plant and animal wastes.

All about Organic Gardening

How to improve your garden's health by using little or no chemical fertilizer or insecticide

ORGANIC GARDENING isn't new. What is new is *non*-organic gardening, which began only a few decades ago when scientists decided that what living substances could do well, factory-made chemicals could do better. Since then—and for the first time in history—people have been trying to grow living things with un-living synthetics.

Like many new systems, non-organic gardening seemed to work fine for a while. Plants grown with chemical fertilizers and pesticides didn't actually grow better, but some of them grew faster and a lot of them grew bigger. Now, though, we're beginning to realize that it's not nice to fool Mother Nature, because apparently that old reap/sow equation still applies. And when you're laying on ammonium sulfate and potassium muriate, you can't expect everything to keep coming up roses.

Gardening with chemicals, it turns out, is habit forming: you need more and more of the stuff in order to get the same results, and no matter how fast you increase the doses you can't even keep up, much less get ahead. Soil hyped-up with chemicals loses its fertility faster than you can lay on the 8-8-8. Plants fed with synthetics lose their resistance to bugs faster than you can spray on the DDT. And worst of all, the

organ pipe microphone: see microphones

Newspapers, plants and leaves should be used to cover and enrich the soil; don't throw them away.

Wood mulch used as a flower bed offers visual decoration as well as benefits such as moisture retention and, after rotting, food and nutritional values.

growth chemicals are doing weird and unwholesome things to the land, the water, and everything that lives. Which is why many scientists—even some who used to be 100-percent advocates of Better Living Through Chemistry—now feel it's time to go back to the old, traditional ways.

The people who have tried it couldn't agree more. Just about everybody who has gone back to the old fashioned techniques of organic gardening finds them more efficient, more interesting, more satisfying, and a lot more fun. Undoubtedly you will, too.

It starts with the soil. Toward the close of the nineteenth century, a German chemist named von Leibig burned some plant matter, made a chemical analysis of the ashes, and found they consisted mainly of nitrogen, phosphorus, and potash (or N, P, and K, as they're known to fertilizer salesmen). From now on farmers and gardeners would have it made. They could take life out of the soil as fast as they wanted to, and never worry about putting it back. Instead, all they had to do was add pure, factory-made N ,P, and K in suitable amounts and proportions—and the soil would be balanced, forever fertile, and better than ever.

That's how the synthetic-fertilizer business was born, and if the whole thing sounds familiar, don't be surprised. It's another case of the "white bread syndrome"—the peculiar exercise whereby industry starts with something that's loaded with natural nutrients, takes nourishment out, puts some back in, and calls the result "enriched."

Organic gardeners do not favor that approach. As they see it, soil isn't some kind of helpful robot. It's a living, breathing organism, and force-feeding it with chemicals is like keeping a person alive with intravenous glucose: it works in a way, but don't expect the patient to leap up and paint the room.

The fact is that no matter how much you use, chemical fertilizers can't make the soil substance called humus. Humus is a vital, living storehouse for a complex variety of soil nutrients, including (but not limited to) N, P, and K. It's made only when plant and animal matter are returned to the soil, allowed to go through the process of interaction and transformation that we call "decay"—and then to be reborn as the rich, varied, and unanalyzable stuff-of-life that feeds and nourishes new growth.

Fallen leaves are a rich source of natural nutrients. Leave them where they are or rake them to be used where needed. Generally, mix with other less dense organic matter.

Leaves are composted in a circular bin; will later be used as source of fertilizer.

In the old days, most gardeners and farmers made humus automatically, because their homesites were "closed systems": everything that came out of the ground they owned went back in because there was no place else for it to go. The cows ate grass and corn, and their manure fertilized the fields; the people ate steaks and buried the bones along with the rest of the kitchen garbage, because there was no garbage disposal or service to haul it away; wastes that weren't buried didn't get piped out to the sea or to rivers (where they could do nothing but harm) but were returned to the soil (where they could do nothing but good) via that much-maligned facility, the outhouse. It was all pretty primitive, but it was also natural, and that's why it worked.

Today, of course, it's pretty hard for a law-abiding suburban-type gardener to go all the way with the "put it back" rule. But you can make good, rich, organic soil by 1) putting some of it back—as much as is feasible, easy, and convenient, and 2) filling up the gaps with commercially available organic fertilizers.

Listed below are some outstanding examples of both kinds of humus-makers. Mix them up as you see fit and in just about any proportions; keep in mind that the more varied they are, the more naturally balanced they are as soil nourishment. Some of them can be laid on the soil just as they are as a mulch (or top layer) around plants; as they decay, they'll enrich the soil. Others don't look too attractive laid on top, so you can dig them into the soil or lay them under a mulch. Or you can mix any or all of them together in any proportions to make compost. Just about all of them look more attractive and decay faster (which means they make humus more quickly) if you grind or shred them before you use them.

Leaves. Just one of the many fertilizers available from house and garden. Don't rake them and haul them away. They're rich in minerals and a valuable fertilizer. Leave them where they are. Or pile them up in shallow heaps, go over them with the power mower to shred them, then spread them around. If you use unshredded leaves as a mulch, mix them with grass clippings to keep them from packing too densely.

Grass cuttings, weeds. Expose weed roots to the air; once they're dried out and dead, they won't re-root. Weeds that have gone to seed should be composted before they're returned to the soil.

Kitchen garbage. This means any organic food garbage from soup-bones to nut-shells: fruit and vegetable trimmings and leftovers, meat scraps, bones, etc. Unshredded and uncomposted, they take a while to turn into humus, but they do get there. Many organic gardeners get fine results by keeping organic garbage in a separate container, then digging it into especially infertile areas of the garden.

Fireplace ashes. These are alkaline, so if you use them alone as a mulch 1) don't use them with acid-loving plants, and 2) don't spread them too close to germinating seeds or new plant roots. They're very good mixed with other fertilizing materials.

Coffee grounds. They're acid in nature, so they're fine for acid-loving plants; or mixed with other ingredients.

Garden residues. Flower stems, prunings, old tomato vines, etc. Use them all, plain, shredded, composted, or turned into the soil with a tiller.

Paper. Newspapers are very good for preventing weed growth and retaining moisture; they're best used after a heavy rain. For appearance (and to keep them from blowing away), cover them with wood chips, hay, or another heavy mulch. Paper eventually decays and turns into humus.

A heavy-duty compost shredder-grinder can be a valuable piece of hardware for the organic gardener. Flower stems, vines, bark, branches, prunings, and other garden residues are made ready to turn into the soil.

Stones. A good natural mulch. Rain leaches minerals from them and adds them to the soil.

Packing materials. Most shrubs and plants from nurseries come in sphagnum, shavings, etc.; save it and use it. Non-nursery items are often shipped in excelsior or shredded newspaper; save them too, for use as mulches, alone or in combination with other ingredients.

Fertilizers from outside sources are also important.

Manure. One of the natural fertilizers that has withstood the onslaught of the synthetics. Manure is available at practically all nurseries.

Peat moss. Also available at all nurseries. Although it contains no nutrients, it's fine for aerating the soil, helps plants absorb nutrients from other materials.

Sawdust. Often available for the asking at lumber yards, and one of the best organic mulches. If you use it "raw"—when it's still pale and dry—mix it with other

organic ingredients; when it's darker and partly rotted, it's fine all by itself.

Hay. Available in easy-to-handle squares that can be laid onto the ground as required. Some organic gardeners use nothing else.

Blood meal. Available in commercial packages at many garden-supply shops. Fine used in compost or mixed with other ingredients. If you use it alone, directly in the soil, use just a sprinkling. It's very high in nitrogen content.

Bone meal. Packaged commercially, sold in most nurseries. A fine natural fertilizer, rich in phosphorus.

Cottonseed meal. Packaged commercially, sold in most nurseries. An excellent and very well-balanced fertilizer.

Hulls and shells. Available in some but not all nurseries, the ground hulls and shells of cocoa beans, rice, cottonseed, etc. are fine fertilizers and mulches. In finely ground, powdery form, they can be applied to lawns. In coarse form, they're excellent and attractive mulches.

How to make compost. Compost is a mixture of soil plus organic fertilizers, kept in a specific place and allowed to interact, decompose, and make humus. You don't have to make compost in order to be an organic gardener, but it does help. First, because it gives you a place to put organic stuff (leaves, clippings, kitchen scraps, etc.) that you can't or don't want to use directly in the garden. Second, because the mixture of ingredients insures that the end result will be rich, well-balanced humus. Third, because the transformation from junk to humus takes place much more quickly when the ingredients are lumped together and interacting with each other.

There are almost as many ways of making humus as there are organic gardeners. For quick decomposition, you can shred or grind the materials: and/or you can toss in some bone meal or manure from time to time. You should keep the compost moist (but not wet), and aerated—either by turning it with a pitchfork from time to time, or by keeping it in a ventilated box,

Hay, a favored mulch of many gardeners, is best when freshly cut. Rain-spoiled hay (no good as feed) is often free from local farmers.

Your soil enrichment program can also make use of wood, garbage or commercial organic fertilizers.

A compost heap is being made by piling vegetable tops from the kitchen and garden refuse (like grass cuttings and weeds which have been exposed to the air so they will dry out and won't re-root). It is especially important to compost weeds that have gone to seed.

or by adding earthworms (which aerate the stuff by making little tunnels). The point to remember is that you really can't go wrong. As long as you start with a mixture of plant/animal matter, sooner or later you'll get a batch of rich super-soil for flower beds, vegetable patch, trees, shrubs, anything.

You can make compost in a heap at one corner of the garden, in a box, a pit, or in one of the commercial compost contain ers. You can make it all at once, by putting in a whole load of ingredients. Or you can make a continuous supply, by adding stuff as you get it, in layers (in the latter case, of course, the stuff you put in earliest will be finished first). For a steady supply in a small yard, many gardeners find it most convenient to make compost in two or more small pits or boxes, spotted inconspicuously near a fence, hedge, etc. Fill one box first, covering it with moist burlap and a board each time you add a layer of organic stuff. When it's filled, let it sit and quietly decompose while you start on your second box. After two to ten weeks (depending on the materials you've used, the weather, etc.) your first box will be ready to use and your second box will be filled. From then on you'll have a continuing supply of rich humus.

Completely finished compost is crumbly, fine, and completely broken down, and while this is required for some uses (like for mixing with sand and loam in seed flats), partly finished compost is great for general purposes. As soon as it's rich, dark, and partly crumbly, it's ready to go to work in your garden.

The best times for using compost depend on your gardening schedule, and so do optimum amounts. Again, though, it's hard to go wrong: unlike chemical fertilizers, compost will never burn plants or

This vegetable patch, fully mulched with organic matter, holds moisture, fights weeds, and needs little care. Note how the wide-track cart easily straddles the rows making it a handy helper for organic gardening chores.

lawns, shrubs or trees. Here are a few of its most common and helpful uses:

Mix it into the top 4 inches of soil a month before spring planting.

During the growing season, cultivate it into the soil or use it as a mulch.

Use it to top-dress established lawns in spring and fall. The best way is to use a spike-tooth aerator, then rake the compost into the lawn.

Use it generously for all new planting projects. For a new lawn, mix it generously into the top 6 inches of the soil. Apply compost thickly around the base of a new tree.

Use the ring method to compost around established trees and shrubs: begin about three feet from the trunk, and continue out to about a foot beyond the drop line at the ends of the branches.

Good bugs, and other friends. It's a natural fact that organically grown plants are much less likely to be attacked by epidemics of bugs and blights than their synthetically grown cousins. Why? Nobody knows for sure, but some scientists will hazard a guess. Organic soil and organic growth are basically healthier, they say. And it's reasonable to assume that plant predators—just like the viruses that attack humans and the cougars that attack deer—have a built-in inclination to hit the weak, the rundown, and the generally unhealthy.

This isn't to say, though, that pests never turn up in organic gardens. They do. But when you see them, don't reach for the poison pellets or the DDT. Instead, fight those natural enemies with these natural friends.

Bugs that eat bugs. Unlike the spray-can poisons, bugs that prey on other bugs don't upset the balance of life in your garden, don't kill birds by mistake, don't have to be kept away from the kids, and don't make it dangerous to eat a tomato fresh off the vine. What they do is destroy vast numbers of insect pests, safely and inexpensively. These three are the most useful.

1. Ladybugs. Their favorite diet is aphids, but when they run out of aphids they'll make do with mites, scale insects and other small pests. A pint or two of ladybugs per year is plenty for the average yard.
2. Trichogramma wasps. These tiny creatures lay their eggs in the eggs or larvae of cabbage worms, and they're especially useful when let loose near trees (especially fruit trees) and shrubs.
3. Praying mantises. Also known as "preying" mantises, because they'll eat any insect they can swallow, and that's most of them. What you buy is praying mantis cases; each hatches 300 or 400 hungry youngsters.

Meat-eating birds. Some birds are pure vegetarians. Others are pure carnivores—or at least like plenty of meat with their potatoes. Birds in the latter two categories are enormously important in insect control. They include swifts, house wrens, barn swallows, phoebes, titmice, chickadees, bluebirds, and scores of others, most of which you can recognize by their beaks: instead of being short and fine like the beaks of the vegetarians, they're long and straight, long and curved, long and sharp, or (occasionally) short and whiskered.

Encourage these helpful birds to come around by providing water (via a clear, cool birdbath—preferably with moving water), and shelter; shrubs, trees, or a birdhouse. And if you must keep cats, keep them well-fed, well-trained, and mostly indoors.

Garden pests can be destroyed without insecticides. Top, wasps released in cabbage plots at a rate of 3 to 5 thousand per acre will destroy cabbageworm larva. With his stinger, center, wasp lays eggs that will destroy the larva of the elm bark beetle. Bottom, gypsy moth is lured and trapped by synthetic attractant, eliminating use of chemical pesticides.

Toads are ideal for disposing of insects so encourage them to stay around your yard by building them a home. Simply knock a hole in a clay flower pot and set it in the ground under an evergreen shrub.

Toads. A toad is the greatest insect disposal in the world. In a typical six-month season (the rest of the time he hiberates), a typical toad will eat 20,000 insects, plus some generous helpings of slugs.

If you don't have toads in your yard, collect some in the spring and bring them home. Best time: after a rain. Best places: in and around shallow pools and marshes. Keep them penned up for a while until they get used to their new surroundings (like under some chicken-wire, but with easy access to insects and water), and then spot them around your garden, each in his own house.

Building a toad house is easy. Start with a clay flower-pot. Knock a hole in one side so the toad can get in and out. Then put it in the ground upside down, a few inches deep and preferably under an evergreen shrub. Keep a shallow pan nearby, and keep the pan filled with water.

And if all else fails . . . . . try treating plants with these homemade non-poisonous insect repellents.

Pepper spray. Grind several pods of very hot pepper in a food chopper. Add an equal amount of water, and strain through a cloth. Add a teaspoon or so of soap powder to make the stuff more adhesive, and spray onto affected plants. Especially good for cabbage worms and maggots.

Green-shallot spray. Grind green shallot onions, then proceed as with pepper spray. Especially effective against aphids.

Elderberry tea. Grind or crush elderberry leaves, add water, and sprinkle or spray the "tea" on diseased or infested plants. Nobody knows why this medicine works, but scientists theorize that elderberry—which is almost never attacked by insects or disease—contains some kind of "immune" organism that can protect and cure.

Garlic. According to a recent study, the juice of garlic cloves possesses strong bactericidal and fungicidal properties. Sprays made with garlic powder (in combinations as mild as 1 part garlic to 100 parts water) have been used to control blight, mildew, and rot in a wide variety of plants.

Companion planting. Your grandparents knew there was one easy way to guarantee that they'd harvest most of the fruit from their home orchard, instead of losing it all

to the birds. Near their apple trees, they planted a dogwood; near the cherry trees, they planted a chokecherry. They realized that given a choice, birds prefer the wild, sour fruits and berries of "ornamental" trees and shrubs to the sweet, tame stuff that humans like best. So they mixed fruit trees with ornamentals, and thereby gave the birds a choice.

Your grandparents, in short, knew more than a little about companion planting—but until recently most of what they and their forbears had learned and observed was lost and forgotten. Or more accurately, it was buried under tons of synthetic "improvements."

But now the secrets of companion planting are slowly being rediscovered—and not only rediscovered, but expanded. We've renoticed that in nature, few plants live alone. What they do is co-exist with each other, in combinations that bring benefits to all of them. And we're re-learning that what works in nature also works best in cultivated land.

In your garden, as in the wilderness, companion plants thrive together because one way or another, Plant A protects or nourishes Plant B, and maybe vice versa. In somecases, Plant A puts something into the soil that Plant B especially needs. More often, Plant A has a strong aroma that masks the aroma of Plant B, thereby "concealing" Plant B from destructive bugs that would otherwise be attracted to it. And in other cases, the link is not as direct but just as effective. Not long ago, for instance, Russian agriculturists discovered that almost any plant subject to cabbageworms will do better if there's some mustard nearby. The reason: cabbageworms are attacked by a parasitic wasp that thrives on the nectar it gets from mustard flowers; with mustard around, the wasp lives longer, lays more eggs, kills more cabbageworms, protects more plants.

Many aromatic herbs and flowers have a repellent effect on most insects pests. Plants like the sweet marjoram, above, and sage, right, are two such samples. Plant them around flower beds, in and around vegetable rows, around or between fruit trees; they are not only attractive filler and border growth, but useful too.

An ideal way of protecting plants without using pesticides is the method called "companion planting." This celery plant may look delicate, but it will prevent your cabbage bed from being destroyed by the cabbage butterfly.

Some of the inter-planting suggestions listed here are the result of formal experiments like that one. Others are based on rediscovered folk knowledge, and many are a combination of the two. Try them as you see fit; and what you learn, pass on to other gardeners. That way you won't just be using the new-old science of companion planting; you'll be contributing to it, too.

All-around companions. These aromatic herbs and flowers have a repellent effect on most insect pests. Plant them around flower beds, in and around vegetable rows, around or between fruit trees.

Herbs: mint, tansy, winter savory, thyme, sage, wormwood, coriander, marjoram.

Flowers: nasturtium, chrysanthemum, calendula, geranium, aster, cosmos, marigold, coreopsis.

See also: FERTILIZERS; FLOWERING BULBS; GARDENING; GARDEN PLANNING; HERBS; LAWNS.

SPECIAL COMPANIONS

INTERPLANT THIS	TO PROTECT THIS	FROM THIS PEST
Celery	Cabbage	Cabbage butterfly
Chives	Peach trees	Peach borer
Chives	Roses	Aphids
Chrysanthemums	Strawberries	Most insects
Eggplant	Beans	Colorado potato beetle
Garlic	Tomatoes	Blight
Garlic	Potatoes	Blight
Green beans	Potatoes	Colorado potato beetle
Horseradish	Potatoes	Potato bug
Marigolds	Beans	Mexican bean beetle
Nasturtiums	Fruit trees	Aphids
Onions, leeks	Carrots	Carrot fly
Onions	Beets	Most insects
Potatoes	Green beans	Mexican bean beetle
Radishes	Cucumbers	Cucumber beetle
Rosemary, sage	Carrots	Carrot fly
Tomatoes	Asparagus	Asparagus beetle
Tomatoes	Cabbage	Cabbage maggot
Wormwood, mint	Kohlrabi, radishes	Black flea beetle

Decorate Your Lawn with a Wishing Well

This attractive piece will add interest to your lawn as well as a shady spot to rest or use as an outdoor buffet

A WISHING WELL is one of the most charming of decorative lawn accessories, a nostalgic reminder of days long past and an eye-catching center that displays your most successful botanical projects. It is also a practical supplement to your yard because in the wishing well you can store numerous gardening supplies, such as a watering hose, trowels, and small tools.

When you have lawn parties, the well also helps make your wishes come true because it adds a gay touch to the occasion with its colorful blooms. The rim of the well serves as a convenient seat for a few guests, or can be used as the serving buffet on which sandwiches and cold drinks are stacked. The hanging bucket can hold ice, as well as the flowers, and the roofed structure provides a shady spot for a rest on warm days in between gardening chores.

The wishing well shown here was built of standard stock lumber available from all lumber dealers. Redwood or cedar are recommended, however, because they withstand all sorts of weather and need no painting.

Wood shingles were used for the roof, but regular composition shingles, made of asphalt with mineral aggregates, will also be very attractive, particularly if you want it to match the roof of your home. Both the bucket and the well itself may be used for flower plantings.

Construction details follow, given step by step:

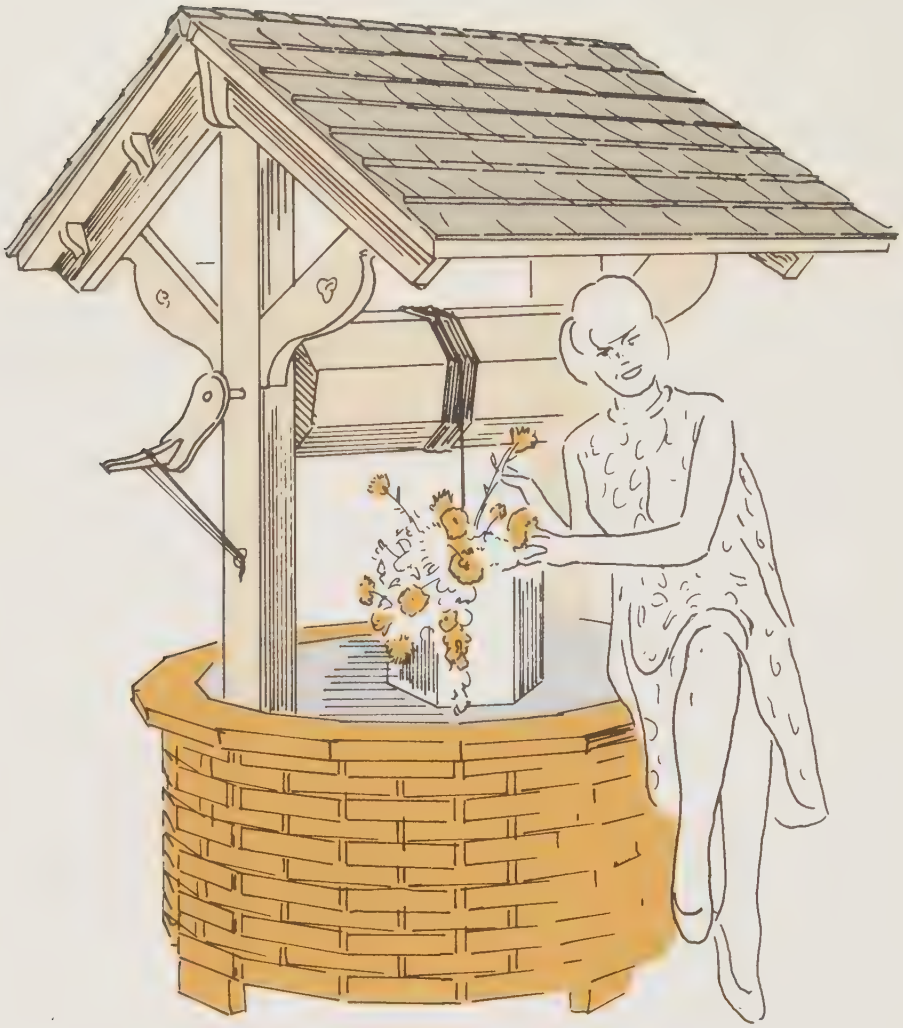
Step 1. The ¼-inch exterior plywood panel is used for a template to guide the the arrangement of bricks for the circular "wall." This 4-foot square panel must be rounded into a circular shape, of 4-foot diameter. To do this, you must first find the center of the panel, so measure the four sides of the panel, marking off the 2-foot positions at the center of each side. Draw lines across from each side to the other. Where these lines cross is the center of the panel.

To draw the 4-foot circle, take a string and attach one end to the center position with a nail. Measure off 2 feet of the string and hold a pencil at that position while you swing the pencil around in an arc, tracing the line on the wood. Or you might take a strip of wood, drilling one end to hold the pencil point, while tacking down the other end exactly 2 feet from the pencil at the center position.

Cut the circle. Next, bisect the circle with additional lines so that you have 16 segments around the circumference. Cut across between all the bisecting lines at their ends to get 16 squared segments.

Step 2. Cut the "bricks" from the 2x4 stock. You will need 176 bricks, each to be 7⅞-inch long, so it would speed the work to set up a jig for fast duplicate and uniform cutting.

Step 3. Start laying the "brick" to assem-



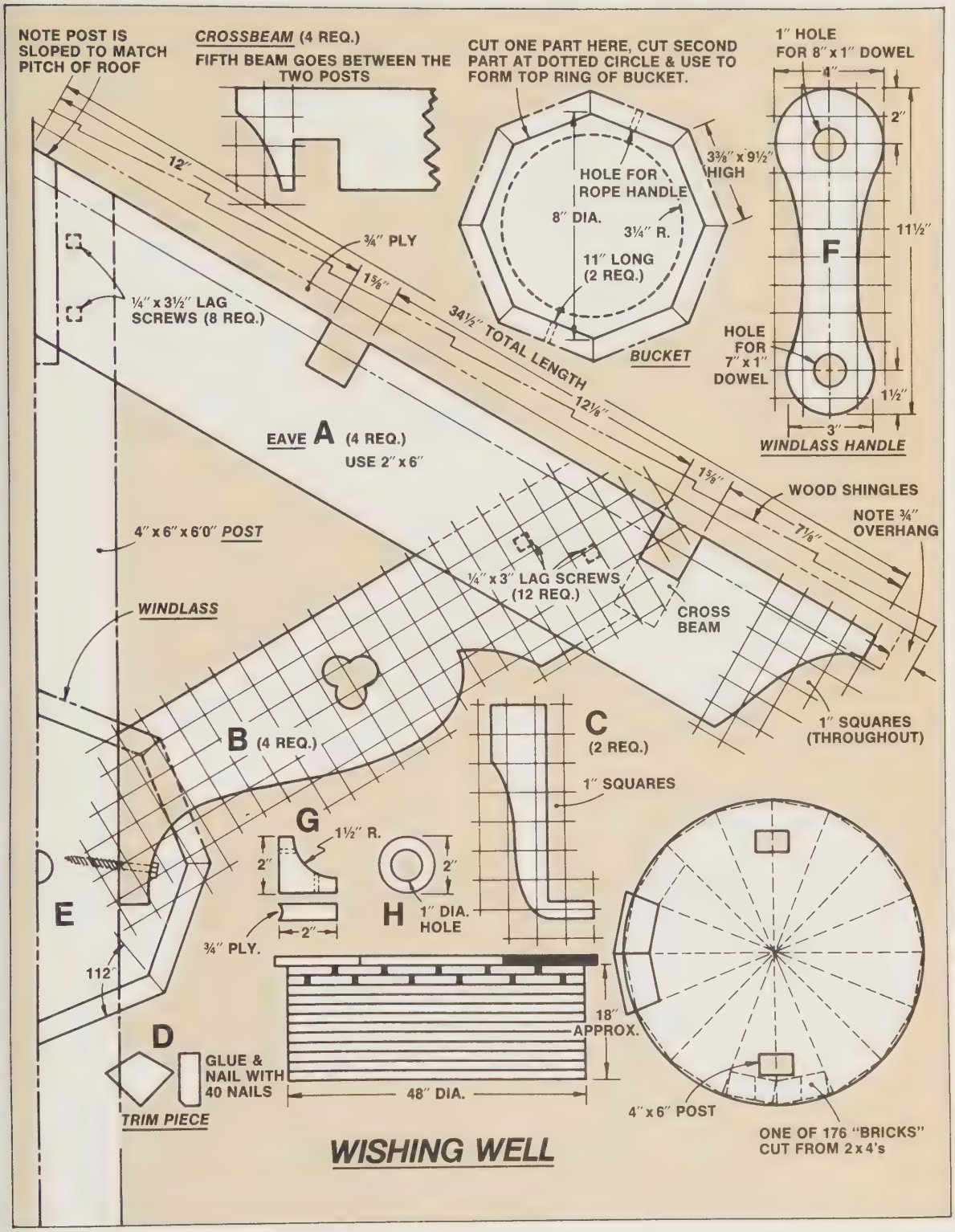
ble the wall. The first course is laid with each brick positioned at one of the squared segments. If you've cut the bricks to the exact length, they will fit neatly around the template. This course is done "upside down" so that the bricks can be nailed to the template.

Turn the unit back over and continue with the second course. These bricks are then placed so that each pair butts together exactly at the center of the brick below.

Step 4. The bricks are fastened securely with 16d box nails and two dabs of waterproof glue. Drill pilot holes for the nails 1½-inch in from each end, apply the glue, then nail in place. Maintain this pattern throughout so that the work will go much faster. The bricks touch at the back corners, but are spread apart at the outside for an attractive appearance. Use a try-square while proceeding to make sure that the wall is going up plumb. There will be 11 courses of brick.

Step 5. Next, make and attach the cap, which goes around the top of the wall. Turn the completed wall assembly upside down, and repeat the bisecting lines on the bottom of the template plywood. The cap is cut from 2x6 stock and fitted to the segments, overlapping about 2 inches on the outside. This overlap must be uniform. Note also that while the bricks are cut square across and thus show a spread, the cap sections are cut to fit snugly together. Lay the cap

Decorate Your Lawn with a Wishing Well 1761



WISHING WELL

sections out around the template, and join them with corrugated fasteners so that you have a complete ring of wood. When completed, remove the assembled cap, turn the wall over again right side up, and nail the cap on the top course of brick to form the rim. This completes the wall part.

Step 6. Cut and shape four eaves (A) from 2x6 lumber, as shown in the drawing, notching them to receive the crossmembers which are 2 x 4 stock (1⅝ x 3⅝ trimmed). Attach the eaves to the 4 x 6 posts, which are obtained by cutting the 12-foot length in half, with 3½-inch lag screws through predrilled holes. Also, drill both posts for the 1-inch dowel that becomes the windlass axle.

Step 7. Shape the trim pieces (C) as shown, from 2 x 8 stock, and attach to the eaves with 8d finishing nails. Cut and shape four eave supports (B) by following a pattern drawn on ruled 1-inch squares, as shown in drawing. Attach these supports to the posts and eaves with 3-inch lag screws through predrilled holes. Raise the posts on the inside of the wall, and attach to the bricks with 6-inch lag screws, making sure that the posts are plumb. The top ends of the post are sloped in the direction of the final roof decking.

Step 8. The four cross beams are notched for a half-lap joint and inserted between the eaves, while a fifth cross beam is located at the center between the posts, toenailed into place, with additional supporting blocks placed underneath against the posts. The roof consists of ¾-inch plywood, which is beveled at the top edge so that the two panels butt tightly at the peak. Attach the roof panel with the box nails. Attach trim edge of 1 x 2 pine stock around the roof with 6d finishing nails. The framework should now be complete, ready for applying the shingles. If wood shingles are used, allow them to overhang ¾-inch all around. Instructions for applying the shingles can be obtained from your supplier.

The rest of the project is simply a matter of following the details in the sketch to make the windlass, the handle and the buckets.

To install the windlass, insert a 6-inch length of dowel through one post and into one end of the windlass, while an 8-inch length of dowel goes through the other post and on into the windlass. Lock the handle securely to the windlass so that it can be turned. The bucket is assembled with glue and finishing nails, reinforced with metal strapping or bailing wire for an authentic appearance.

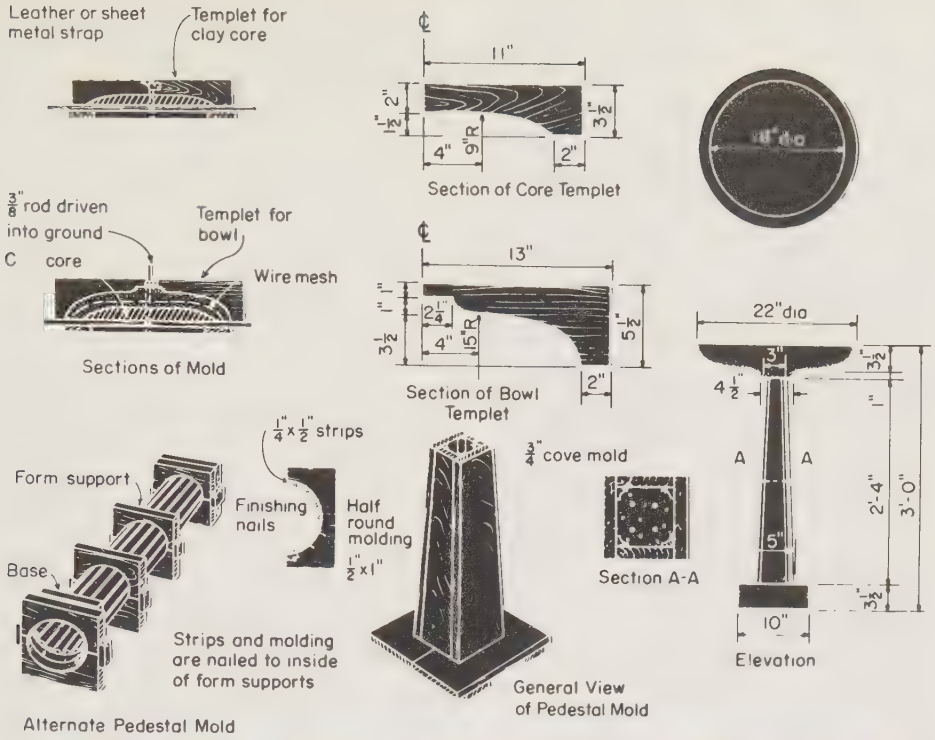
Original design by Steve Ellingson.

See also: BRICKWORK; CARTS; FURNITURE, OUTDOOR; MASONRY.

MATERIALS LIST

Quantity	Size and Description	Purpose
1	¾″ 4′x8′ exterior grade fir plywood	roof
1	¼″ 4′x4′ exterior grade fir plywood	template
18	2″ 4″x8′ redwood or cedar	bricks and roof beams
1	4″ 6″x12′ redwood or cedar	posts
3	2″ 6″x12′ redwood or cedar	eaves and supports
1	1″x3′ hardwood dowel	windlass axle and handle
1 bale	wood shingles	roof

NOTE: Also need box nails, shingle nails, finishing nails, lag screws, brass screws, corrugated fasteners, rope, wood filler and waterproof glue.



Casting Your Own Lawn Birdbath

Be creative and design your own, or follow the suggested forms here, to make an attractive lawn ornament

ONE POPULAR AND ATTRACTIVE lawn ornament is a birdbath. There are many precast concrete birdbaths available in many sizes from concrete manufacturers, but you can save some money and get exactly the style you want, if you cast your own.

If you do wish to cast your own birdbath, it can be built in three separate parts: the bowl, the pedestal and the base. The bowl is cast bottom-side-up over a clay core, disk, or any similar convex surface. Place a low slump concrete mix over the dried, oiled core to a depth of about one inch, then place wire mesh reinforcement. Follow this with another layer of one inch thick concrete which is shaped using the bowl templet. Set a ½ x 3-inch bolt in the exact center with the threaded end projecting out about two inches. This done, cure the concrete.

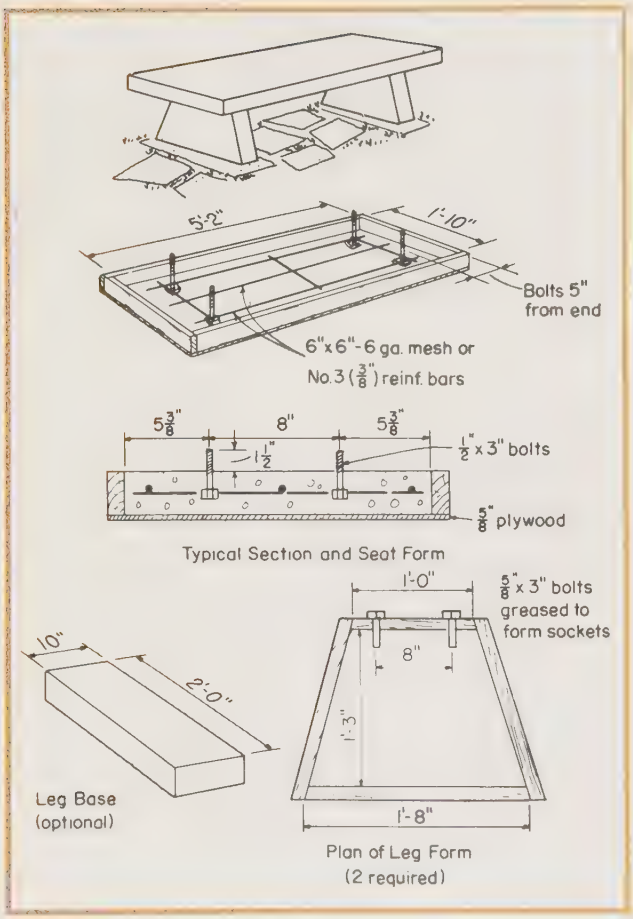
A rectangular pedestal may be formed by using the flat forms as shown in the diagram. Pieces of ¾-inch cove molding should be placed in the corner of the mold. A ⅝-inch greased dowel is centered and set three inches deep in the top of the pedestal after the concrete is placed. The dowel is removed when the concrete sets, leaving a hole to receive the bolt projecting from the bowl.

A 3½ x 10-inch base may be used for the pedestal. Or, the pedestal form can be set over a post hole dug below the frostline. Use a 1:2:2¼ mix of concrete for this project. After all the parts have been covered and cured, assemble the bowl to the pedestal. The diagram shows one style of forming for the birdbath, but with a little imagination, you can follow the same procedure and design your own. M.E.F.

See also: BRICKWORK; CONCRETE; CONCRETE, DECORATIVE; LANDSCAPING.

Add a Restful Air to Your Yard

Precast concrete lawn benches are available, but casting your own bench has the advantages of suiting your tastes and saving money



LAWN OR GARDEN BENCHES lend an inviting, restful air to your outdoor living area. Precast concrete benches of many designs are sold by precast product producers.

But you can also make your own garden bench. Use straight, dressed 2 x 4-inch lumber for forming. Reinforcement is needed for the seat section. Use three # 3 x ⅜-inch round reinforcing bars lengthwise and wire them to three reinforcing bars 16 inches long crosswise.

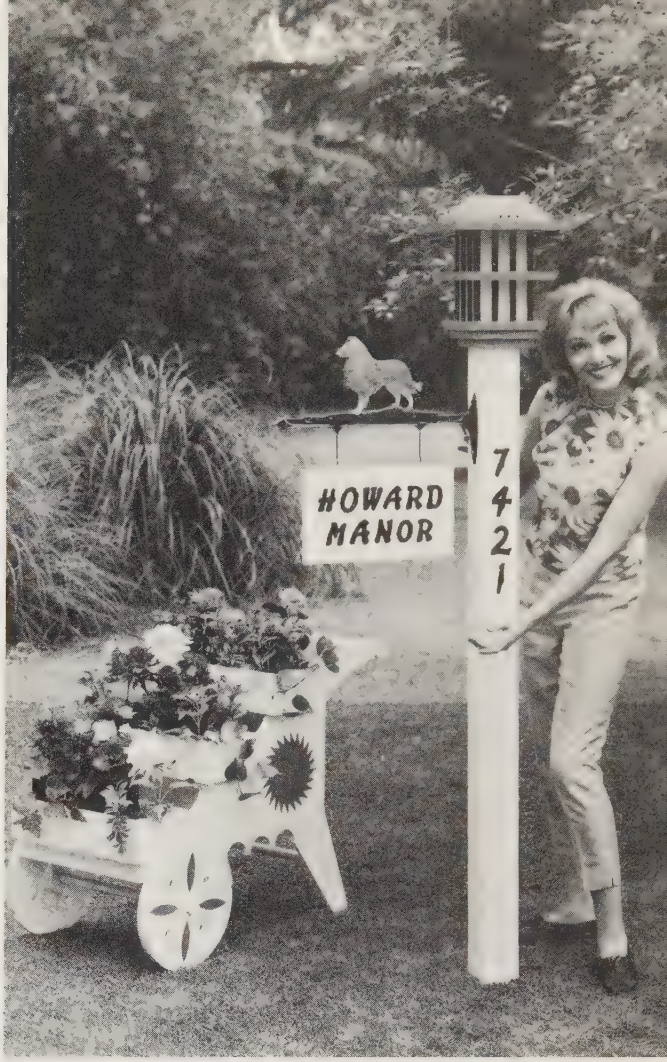
Concrete materials for lawn bench. A suggested mix is one part cement, two parts sand and two and a quarter parts gravel. Gravel should be screened to ¾-inch diameter but no larger. Five cubic feet of concrete will make the seat slab and two end supports.

Assemble oiled forms on an oiled wood base or on concrete slab that has been covered with a polyethylene sheet. Place a 2-inch layer of concrete in the seat form. Work the concrete carefully along the inside edge of the form with a trowel so that it is tight against the form. Level the concrete, then place the reinforcing bars as shown. Add concrete to the top of the forms and strike it off level with a 2 x 4, using a sawing motion. Smooth the surface with a wood float. Allow the mixture to stiffen, and after the watery sheen has gone, use a steel trowel for the finish. Use an edging tool around the form to obtain a smooth, dense well-rounded edge. M.E.F.

See also: BRICKWORK; CONCRETE; CONCRETE, DECORATIVE; MASONRY.

Build a Lamppost for Your Front Yard

Accessories add beauty to your front lawn. This easy-to-build lamppost will illuminate your entryway and carry numbers for easy identification of your address



FRONT LAWNS AND YARDS, like wearing apparel, need accessories. They help to provide the accent which reflects the "personality" of our homes.

The post light also has a practical side, serving to illuminate the entranceway and to carry the house number or family name, making it easy for guests to locate your home.

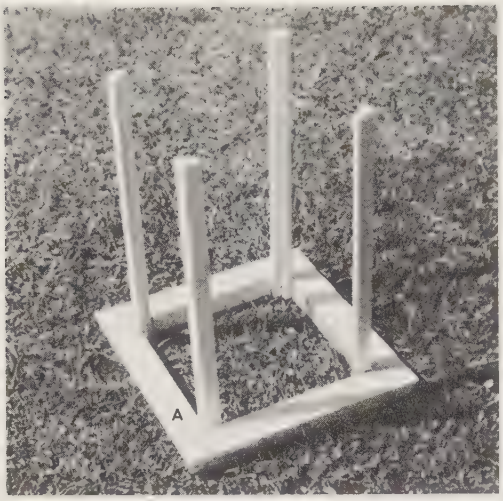
Begin by assembling the lamp cage (Part A). Cut four pieces from the 1x12-inch stock, each to be 1¼ x $6\frac{11}{16}$-inch in size, and bevel one long edge of each piece. Join the four pieces into a square by butting one end of each piece against the side of an adjacent piece, so that the final assembly is 8x8 inches square.

Cut the corner molding into four pieces, each 9½-inch long. Attach the moldings into each corner of the "A" assembly with ½-inch brads.

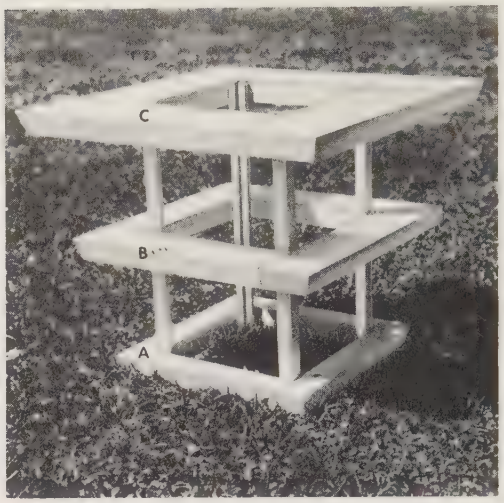
Form the Part B assembly consisting of four pieces of the 1 x 12 stock, each cut to 2x7½-inch in size and joined to form a square 9½ x 9½-inch in size. Place this B assembly over the corner moldings of the first assembly at a point halfway up their length and attach with ½-inch brads through the molding stock.

Form the Part C assembly by cutting four pieces of 1 x 12 stock, each 3 x 8½-inch, and join to form a square measuring 11½ x 11½-inch. Attach this square with brads to form the top moldings. This forms the basic lamp cage.

The cage cap is formed by making and joining Parts D, E, F, and G. Part D is made by cutting four pieces of 1 x 12 stock to 1½ x 6⅞-inch in size and joining them to form a square 8¼ x 8¼ inches. This

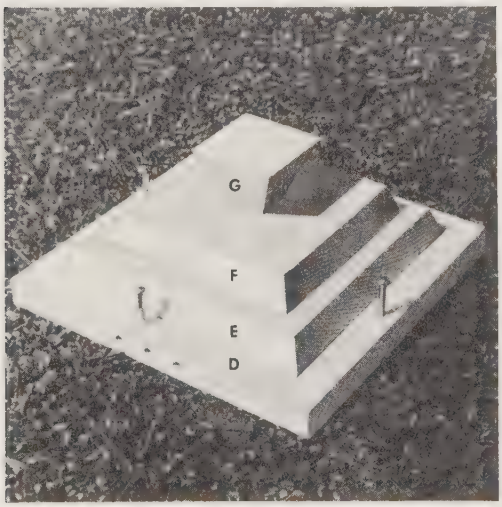


Start of the lamp cage assembly consists of joining the four A strips. Vertical right-angle moldings are for holding cage glass.



Three beveled-edge square sections of different sizes (A, B, C) are attached to vertical moldings with brads, completing lamp cage.

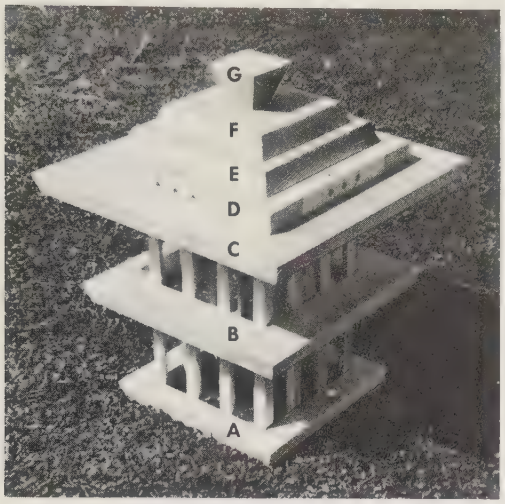
Cage cap is made of four sections. Three (E, F, G) have beveled outside edges. Lower (D) square has ventilation holes drilled in edge.



End view of completed lamp cage, showing double wood strips at each side with metal clips used to hold glass panes in position.

square is drilled through the side edges to make nine ¼-inch vent holes, as shown. Also, drill four holes through the thickness of the stock for attaching the cap to the cage base with #8 round head screws. Parts E and F are solid pieces of the 1 x 12 board, cut to sizes shown, forming 6⅞ and 5¼-inch squares respectively. The top member is a piece 1¾-inch thick, 2¼-inch square (this piece can be formed from a small waste piece of 2 x 4 stock). The edges are beveled all around. Form this cap

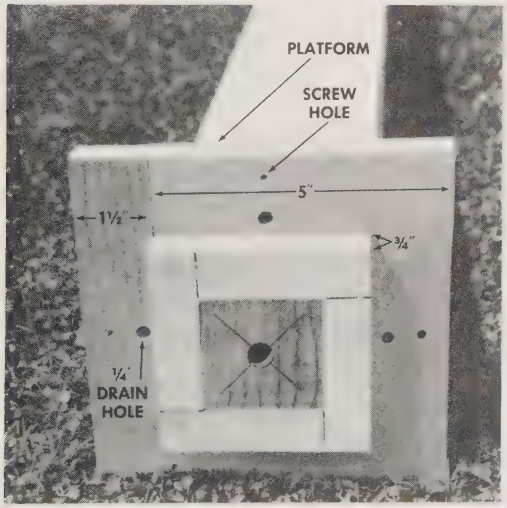
Build a Lamppost for Your Front Yard 1767



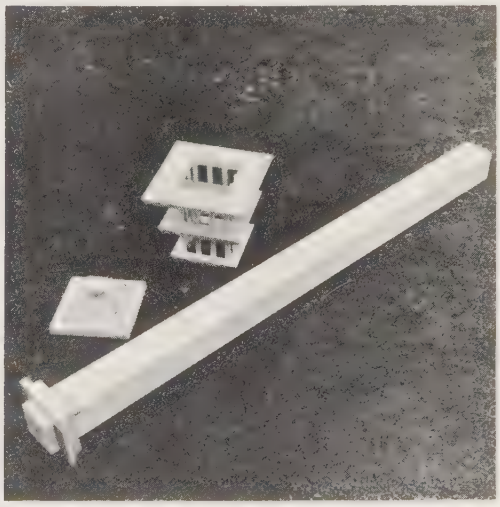
Entire assembly of lamp cage and cap is lettered to show position of all parts. The panes can be fitted to cage at glass shop.

Post is 4 or 5 feet long, with a hollow core for lamp wiring. Sides are overlapped and joined snugly with flat head screws.

The platform section is made to dimensions shown here. The four parts are to be joined around post at 3/4-inch from post end.

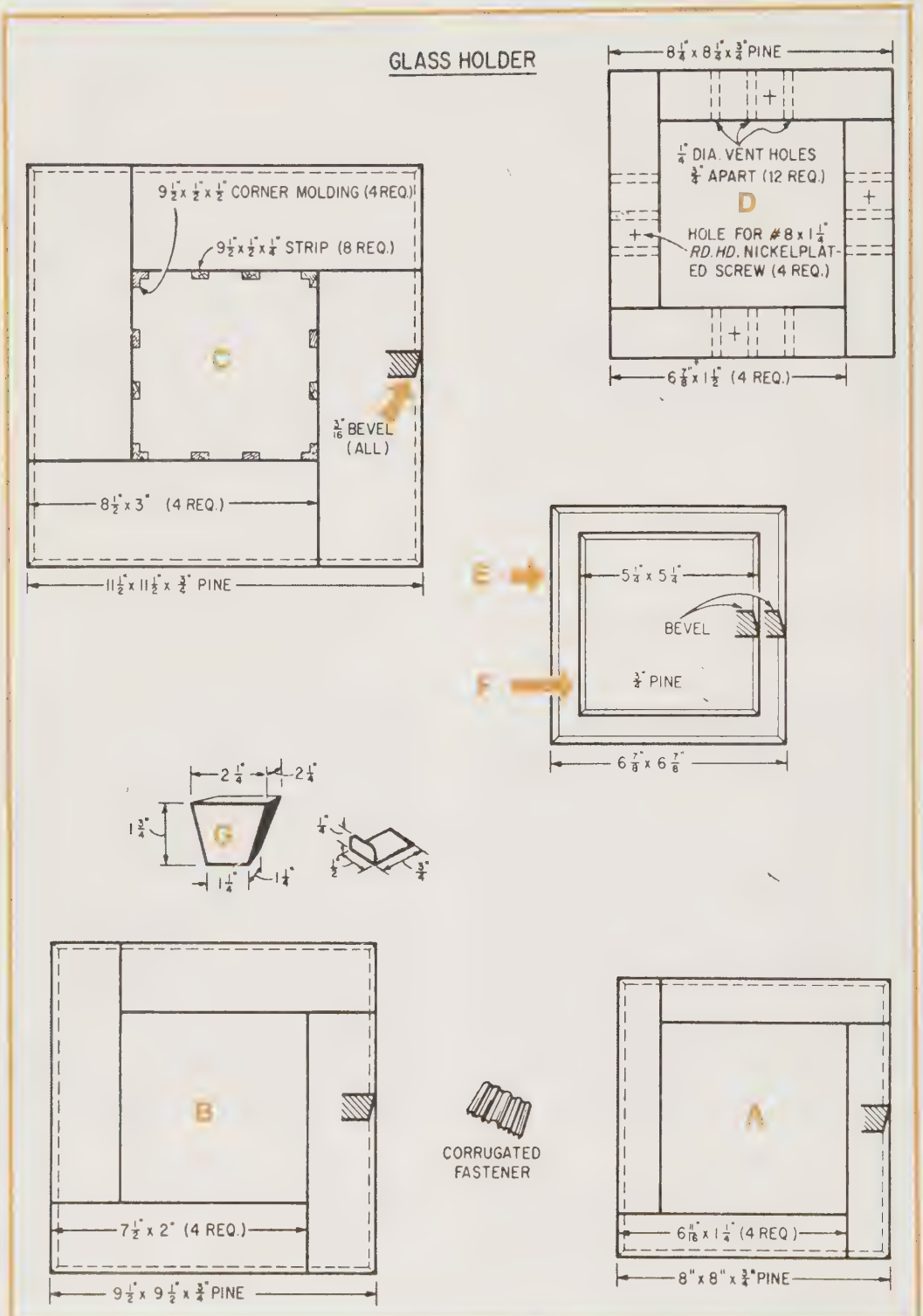


All parts completed, ready to be joined and erected on a concrete base. Lamp socket is fitted into solid piece at top of post.



assembly by nailing the thick G piece to the larger F part, then nailing the F part to the E member, and finally this entire assembly is nailed to the D part and the entire cap is then joined to the lamp cage with four screws.

Cut eight strips of ¼ x ½-inch wood to 9½-inch lengths, and tack them into the cage with ½-inch brads. Two strips go into each side, evenly spaced. Take the cage to your local glass shop and have them cut the four pieces of glass to fit the


GLASS HOLDER
8¼" x 8¼" x ¾" PINE
¼" DIA. VENT HOLES ¾" APART (12 REQ.)
D
HOLE FOR #8 x 1¼" RD. HD. NICKELPLATED SCREW (4 REQ.)
6⅞" x 1½" (4 REQ.)
9½" x ½" x ½" CORNER MOLDING (4 REQ.)
9½" x ½" x ¼" STRIP (8 REQ.)
C
3/16" BEVEL (ALL)
8½" x 3" (4 REQ.)
11½" x 11½" x ¾" PINE
E
F
5¼" x 5¼"
BEVEL
¾" PINE
6⅞" x 6⅞"
2¼"
2¼"
1¾"
G
1¼"
1¼"
¼"
½"
¾"
B
7½" x 2" (4 REQ.)
9½" x 9½" x ¾" PINE
CORRUGATED FASTENER
A
6 11/16" x 1¼" (4 REQ.)
8" x 8" x ¾" PINE

cage. Have the glass cut $\frac{3}{16}$-inch shorter than the full depth of the cage, allowing room for the retainer tacks. These are set into the top edges of the wood strips by bending the brads at right angles with pliers after they are driven part way in. The glass is retained at the bottom with small metal glass holder clips having one end bent at right angle and drilled for a screw hole. Your lamp cage is now complete. Proceed with construction of the post.

Decide on the height of the post according to your preference. A good height would be 4 or 5 feet to which is added the lamp cage. Cut four pieces of 1 x 12 stock to a 2¾-inch width and of the required length. Join these four pieces into a hollow post, each piece overlapping the adjacent side, so that the total width of your post is approximately 3½ inches. Assemble with countersunk 1½-inch screws, covering the screwheads with wood filler.

Fit a piece of solid 1-inch stock into one open end of the post, drilling this block with a center hole large enough to hold a lamp socket. Next, make a lamp platform of four pieces of wood, each 1½-inch wide and 5 inches long and joined into a square around the post at about ¾-inch from the end. This platform, which will be 6½ x 6½-inch square, is drilled to provide four drain holes as shown. Two holes are also drilled for attaching the lamp cage with round head nickelplated screws. The platform is trimmed underneath with ¾-inch wide strips, attached with brads underneath. The lamp cage can be lifted off by removing the two screws whenever it is necessary to change the bulb.

The post is set up on a cement base which extends 18 to 24 inches into the ground, and which has a square projection on the top onto which the post is fitted. The cement base is poured around a bent piece of conduit into which the weatherproof wire cable is snaked.

The electric cable should connect to the house current through an accessible wall switch inside the house so that the light can be turned on and off as desired. If the post is close to the house, the cable can be run above ground (if local codes allow) and, through a basement window, into the house. A lamp that is set at the front of the lawn will require running the cable underground to the nearest connection point. Follow all requirements of the Electric Code in making the wiring connections, or have this done for you by a licensed electrician so as to conform with the Fire Underwriters requirements.

A very convenient addition is a time clock which can be used to control the lamp. This may work either by setting the clock to switch the lamp on at a certain hour or, if there is an electric eye, the lamp will go on when darkness falls.

Original design by Steve Ellingson.

See also: CONCRETE; LANDSCAPING; LAWNS; LIGHTING; PATIOS; WIRING, ELECRICAL.

MATERIALS LIST

Quantity	Size and Description	Purpose
1	1″ 12″x12′ clear pine	lamp cage and post
4	1/2″ 1/2″x9 1/2″ corner molding	lamp cage
8	1/4″ 1/2″x9 1/2″ strips	lamp cage
as needed	#8x1 1/2″ flat head wood screws	
as needed	#8x1 1/4″ round head nickel-plated screws	

NOTE: Also need outdoor electrical connections, glass, brads, finishing nails and corrugated fasteners.

Choosing an Outboard Motor

The wide variety of horsepower ratings of the power plants require you to analyze your needs before you buy

BEFORE YOU CHOOSE a power plant for your outboard, you must be very certain of what your needs are because of the many different horsepower ratings and models on the market. With available horsepower ranging from the tiny 1½-hp models up to huge power plants with 100, 115 and 135 hp, it is obvious that great care and consideration should be expended before any decision is made.

We have to assume that the prospective outboarder has some idea of what he wants, but all too often the initial lure turns out to be a minor area of activity once an outfit is purchased. No outboard outfit is going to be all things to all people. Some degree of compromise is necessary. But if time is taken at the outset to think things out, years of fun and recreation are possible.

Just as in purchasing a new home, a new car, or any major appliance, the prospective owner should look over all available makes and models and discuss his requirements with the dealers in his vicinity. These people live outboarding, and they are well qualified to offer sound advice on just what size boat and motor will best meet the re-

quirements of the individual. We recommend talking with several representative outboard dealers before making up your mind on any particular make or model. While you may have a specific brand-name preference, ideas regarding size and type may be obtained from a dealer who handles a competitive line.

If fishing is your forte, it is of prime importance that your motor have great flexibility of operation. You will want a motor that permits slow trolling for extended periods of time and operates over shallow bottoms and through weeds. The type of fishing one does should be reviewed with the dealer, for if you contemplate operating on small lakes or rivers the length of time it takes to get to fishing spots is not very important. But if big waters are involved, speed is an important factor.

Another point to be seriously considered is the portability of the motor. If much carrying is anticipated, such as to and from the car or from a lodge to water's edge, do not burden yourself with a heavy motor.

Another factor to think about is whether or not you will use your own boat or will be dependent upon liveries or boat-rental agencies. Check first to be sure the livery operators in the areas you will be frequenting do not have a maximum horsepower limit for their boats which is less than that of the motor you are thinking of buying.

Obviously there are many more facts to be considered, and you can be sure that your outboard dealer can give you helpful advice before a decision is made as to make and model.

If the proposed use for your outboard is other than fishing and the purchase of a boat is also involved, more careful analysis is necessary. There is no great problem if the prime use is to be cruising or some other specific activity such as skiing. Here the choice depends on just how much you want to spend. But there are very few newcomers at outboarding who find they will limit their recreational boating to one specific area of activity. What may have started out to be a summer of cruising might well turn out to be a season of skiing, with a dash of cruising on the side, or vice versa. Here is where a degree of compromise is important. Fortunately, today's outboard boats and outboard motors have been developed to the point where they are satisfactory for many activities. Through research and development, outboard boat and motor manufacturers have been able to add tremendous flexibility to their products. There are runabouts ideal for skiing which convert quite satisfactorily into cruising craft, and with the advent of higher horsepower motors, there are ideal cruising models that will do a commendable job of towing skiers. While the largest motors will run at reasonably slow speeds for some part-time fishing activity, the addition of a small horsepower motor for slow trolling increases the utility of larger boats.

One cannot arbitrarily sit down and make specific recommendations as to what size or model boat with what horsepower will do the best possible job for an individual or a family. One must know just what features are important to the individual and what kind of recreation is being planned. This is where the advice and counsel of the outboard dealers in your area will be of great value. Also, almost every city of consequence is the scene of one or more boat shows at which all the major manufacturers exhibit their new products. Attendants at these shows are well-qualified personnel who can discuss your needs and offer suggestions which may add materially to your outboarding pleasure.

Outboarding is a great recreational sport. Be sure you start off on the right foot and derive all the pleasures and benefits it can offer.

See also: BOAT ENGINE; BOATING.

Maintaining Your Outboard Motor

Keeping your outboard motor in good shape will increase its useful life and improve the performance of your boat

MAINTENANCE OF YOUR OUTBOARD motor begins when you take it out of storage and prepare it for the season. Remove and inspect the spark plugs. Clean them and set the gap according to the recommendation in your owner's manual. Replace any defective plugs and replace all gaskets, whether they appear to need it or not.

Remove the oil level plug and make sure the gear case is filled. If you didn't change the oil before you stored the engine, complete the chore now.

To change the oil, remove both the oil level plug and the drain/fill plug and, with the motor in its ordinary position, allow the oil to drain out. Then, insert a tube of oil recommended by the manufacturer in the drain/fill plug and inject it into the casing until the level rises to the oil level plug. Replace the oil level plug before removing the tube of oil and replacing the drain/fill plug.

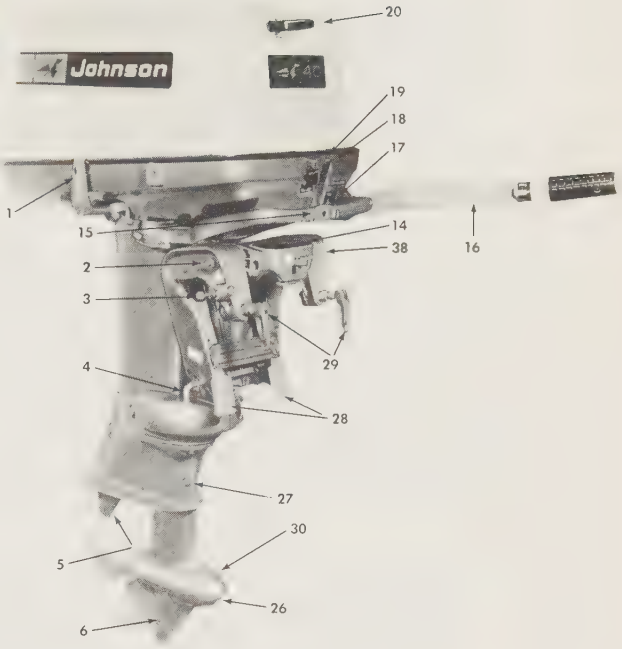
If your gear case oil does not come in a tube, replace the drain/fill plug after the case is drained and pour the oil in the oil level hole. Do it slowly and allow plenty of time for trapped air to escape. Replace the oil level plug.

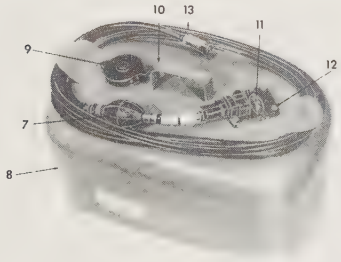
Make sure the battery has a full charge and clean the terminals and connections. Double check polarity when you replace it and coat the cable connections with grease to forestall corrosion.

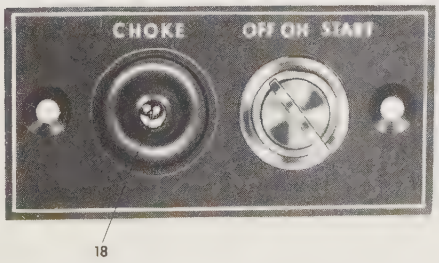
Operate the engine in a test tank, if you have one, to check the water pump and thermostat. Do not operate the engine in the tank without a test wheel on the propeller shaft.

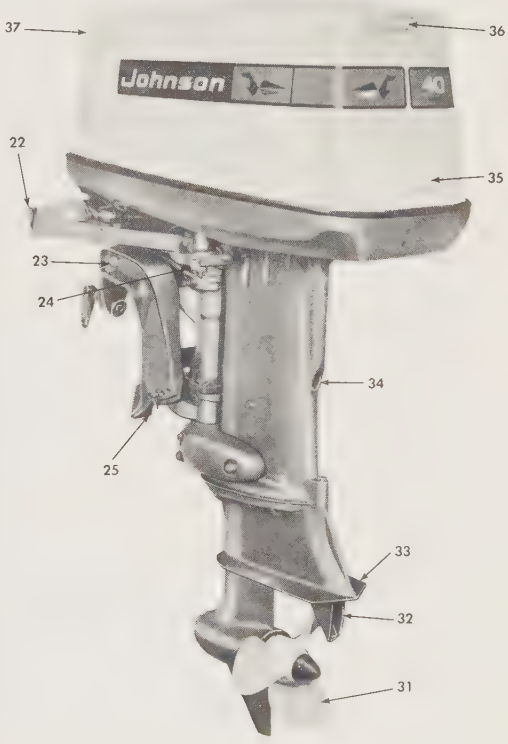
In addition, the engine requires periodic

REF. NO.	PART NAME	QTY.
1	Shift Lever	1
2	Tilt Friction Nut	1
3	Tilt Lock	1
4	Tilt Adjusting Rod	1
5	Water Intake	1
6	Skeg	1
7	Priming Bulb	1
8	Fuel Tank	1
9	Filler Cap	1
10	Handle	1
11	Fuel Gauge	1
12	Drain Screw	4
13	Fuel Line	1
14	Model and Serial Number	1
15	Remote Steering Bracket and Handle	1
16	Steering Handle and Throttle Control Grip—Manual Start Only	1
17	Stop Button—Manual Start Only	1
18	Choke	1
19	Slow Speed Knob	1
20	Starter Handle	1
21	Dash Plate—Electric Start Only (Includes Cable Assembly)	1
22	Auxiliary Throttle (Electric Start Only)	1
23	Safety Chain Lug	1
24	Idle Speed Screw	1
25	Tilt Rod Retainer	1
26	Oil Drain/Fill Plug	1
27	Oil Level Plug	1
28	Stern Brackets	2
29	Clamp Screws	2
30	Gear Case	1
31	Propeller	1
32	Exhaust Outlet	1
33	Anti-Cavitation Plate	1
34	Water Discharge	1
35	Locking Lever—Cover	1
36	Tilt Grip	1
37	Motor Cover	1
38	Reverse Lock Lever	1









maintenance every 50 to 100 hours of use, according to the manufacturer's specifications, or at least once a season.

This periodic service includes draining and refilling the gear case, cleaning and regapping the plugs, cleaning the filter bowl, lubricating the grease fittings, controls and linkages, according to recommendations, adjusting belt tension and checking the condition of breaker points, timing and carburetor adjustment.

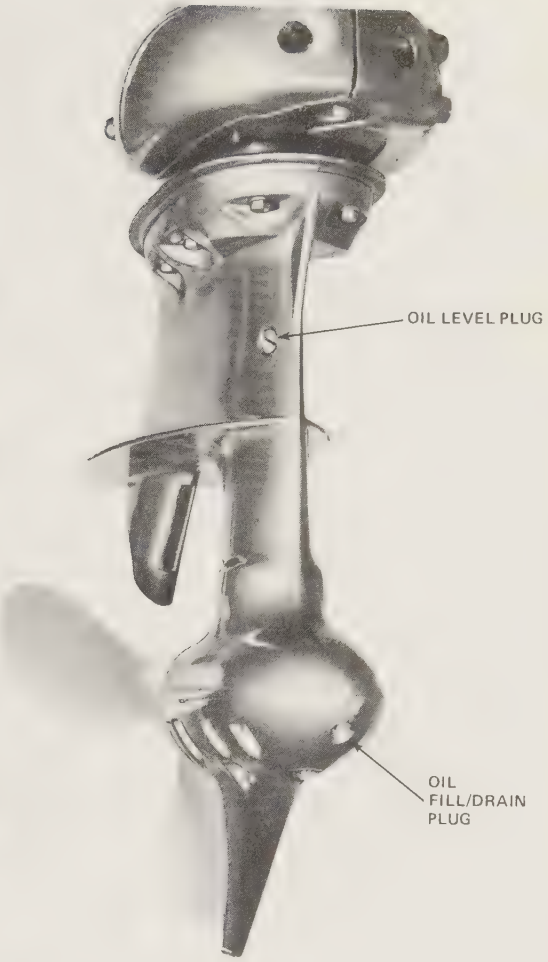
The owner's manual will contain instructions for carburetor adjustment. Generally, it's done this way. Start with a warm engine. Operate it at low-speed and adjust the low-speed knob until the motor idles smoothly. If additional adjustment is necessary, stop the engine and remove the cover. Pull the low-speed knob and arm off the needle, taking care not to bend the linkage. Turn the needle valve until it seats gently. Do not force it. When it seats, back it off one and one-quarter turns. Start the motor and run it until it is warm. Back off the idle speed screw. Throttle down to idle speed and adjust the needle valve until the best performance is obtained. Replace the slow speed arm in horizontal position and the knob in vertical position, with the pointer up. Do not disturb the position of the needle while installing the arm. Readjust the idle speed screw.

TROUBLE-SHOOTING AN OUTBOARD MOTOR

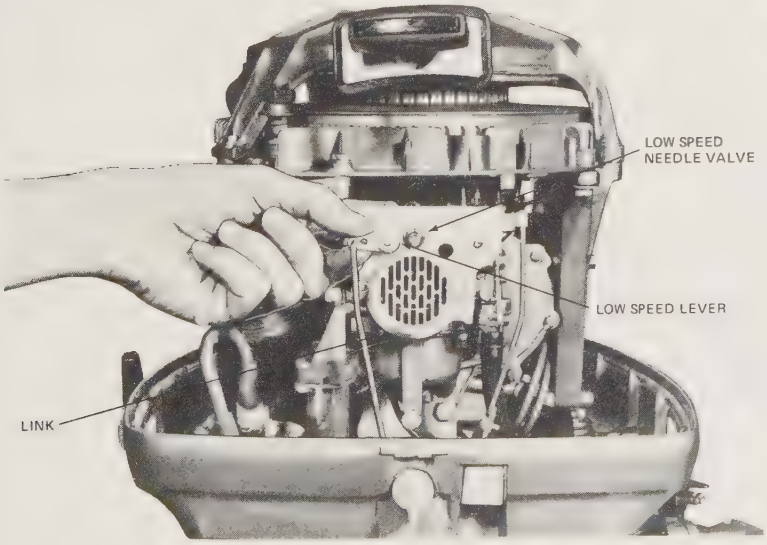
Problem	Check
WILL NOT START	Throttle control in START position, SHIFT control in NEUTRAL position Fuel in tank Fuel line connector properly attached Fuel line primer bulb at tank end Carburetor primed (squeeze primer bulb) Fuel tank resting on fuel line Fuel line clear and not kinked Cold motor, engine not choked sufficiently Warm motor, engine over-choked or flooded (do not not choke motor, disconnect fuel line at motor, and crank until cleared) Fuel pump filter obstructed Water in fuel system Battery and connections (electric start model) Loose spark plug leads Spark plugs carboned, burned, or wet Incorrect gap in spark plugs (correct gap .030) Loose spark plugs, causing poor compression (recommended torque 17½ to 20½ ft. lbs.) Recheck starting instructions
WILL NOT IDLE PROPERLY	Carburetor adjustment improperly set Defective spark plugs Improper fuel mixture
LOSES POWER	Defective spark plugs Fuel pump filter partially restricted or fuel contaminated Obstruction at water intake. Cooling system not operating properly
VIBRATES EXCESSIVELY	Bent or broken propeller Carburetor improperly adjusted Loose steering friction screw Weeds on propeller
RUNS, BUT MAKES LITTLE OR NO PROGRESS	Bent or broken propeller Sheared drive pin Weeds on propeller

Disconnect the fuel line before disassembling a fuel filter for cleaning. These usually come apart simply with the removal of a screw. Remove the cover and screen and

Changing spark plugs, or at least cleaning and regapping them, is a good practice when you are getting ready to put your boat into the water for a new season.



Gear case is lubricated from bottom hole by forcing lubricant in with a tube. If lubricant does not come in a tube, it can be poured in the oil level hole, but pour slowly and allow plenty of time for trapped air to escape.



Location of low-speed needle valve.

clean the screen with solvent and a brush. Be sure to reassemble the elements in correct order.

To prepare your outboard motor for storage, first run it in fresh water, if it has been operated in salt water. Then, place it on a stand in the normal upright operating position.

Retard the throttle all the way and disconnect the spark plug leads. Leave these leads disconnected during storage so there will be no danger of the engine being started accidentally.

With the spark plug leads disconnected, rotate the flywheel manually several times to remove all water from the water pump and drain the carburetor float chamber. Remove the fuel filter bowl and drain it and clean it. Replace the filter element and gasket with new ones.

Drain and clean the fuel tank.

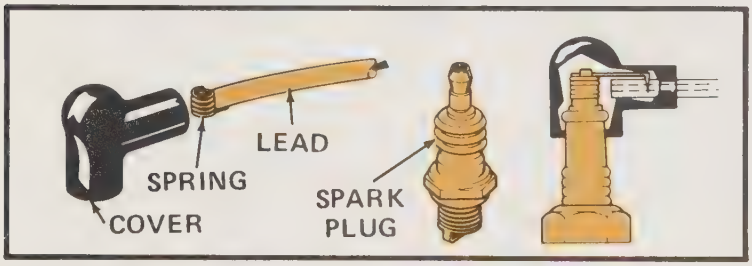
Remove the propeller and check its condition and pitch. Lubricate the propeller shaft with grease and replace the propeller, using a new drive pin and a new cotter pin or tab lock washer for the propeller nut.

Clean and lubricate the electric starter mechanism, but keep the shaft free of oil.

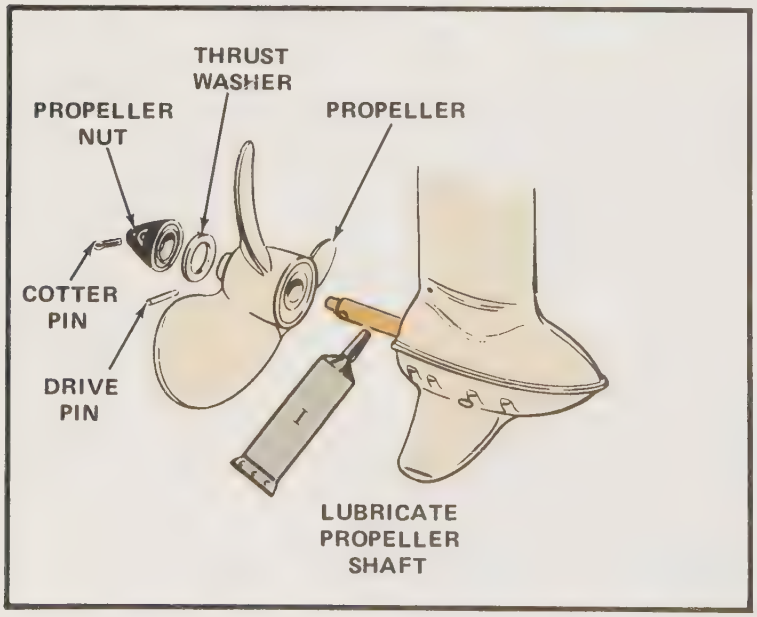
Wipe the entire external surface of the motor clean and wax it with automotive wax. Store the engine upright in a dry, well ventilated room.

Remove the battery from the boat. Check the fluid level and keep it charged during storage. F.C.

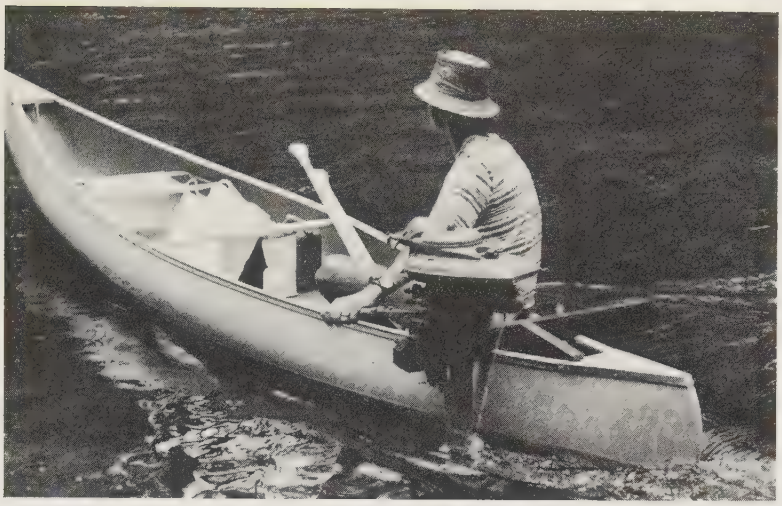
See also: BATTERIES; BOAT ENGINE; BOATING.



When inserting spark plugs, make sure spring is firmly seated on spark plug post.



Let your maintenance schedule include lubrication of the propeller shaft. At the same time inspect the propeller for bends or other damage. Always carry at least one extra drive pin and an extra cotter pin on your boat—an extra propeller, too, if one is available.



Motorize Your Canoe

It takes about an hour to build this sturdy mount for a small outboard motor

PADDLING A CANOE can be a lot of fun but there are times when it's a relief to put the paddles aside and let a small outboard motor do the work. This sturdy little motor bracket will let you do just that.

You can make one in about an hour at a total cost of around $3 and the bracket will fit aluminum, fiberglass or wood canoes as well as some kayaks.

Start by laying the 3½-foot length of 2x4 cross member on its side about 10 inches forward of the canoe's stern plate. Make sure that there is at least 13 inches of overhang on each side so the propeller will clear the canoe's side. Then, following the contour of the gunwale, mark the cross member for notching. Remove and notch 1-inch deep.

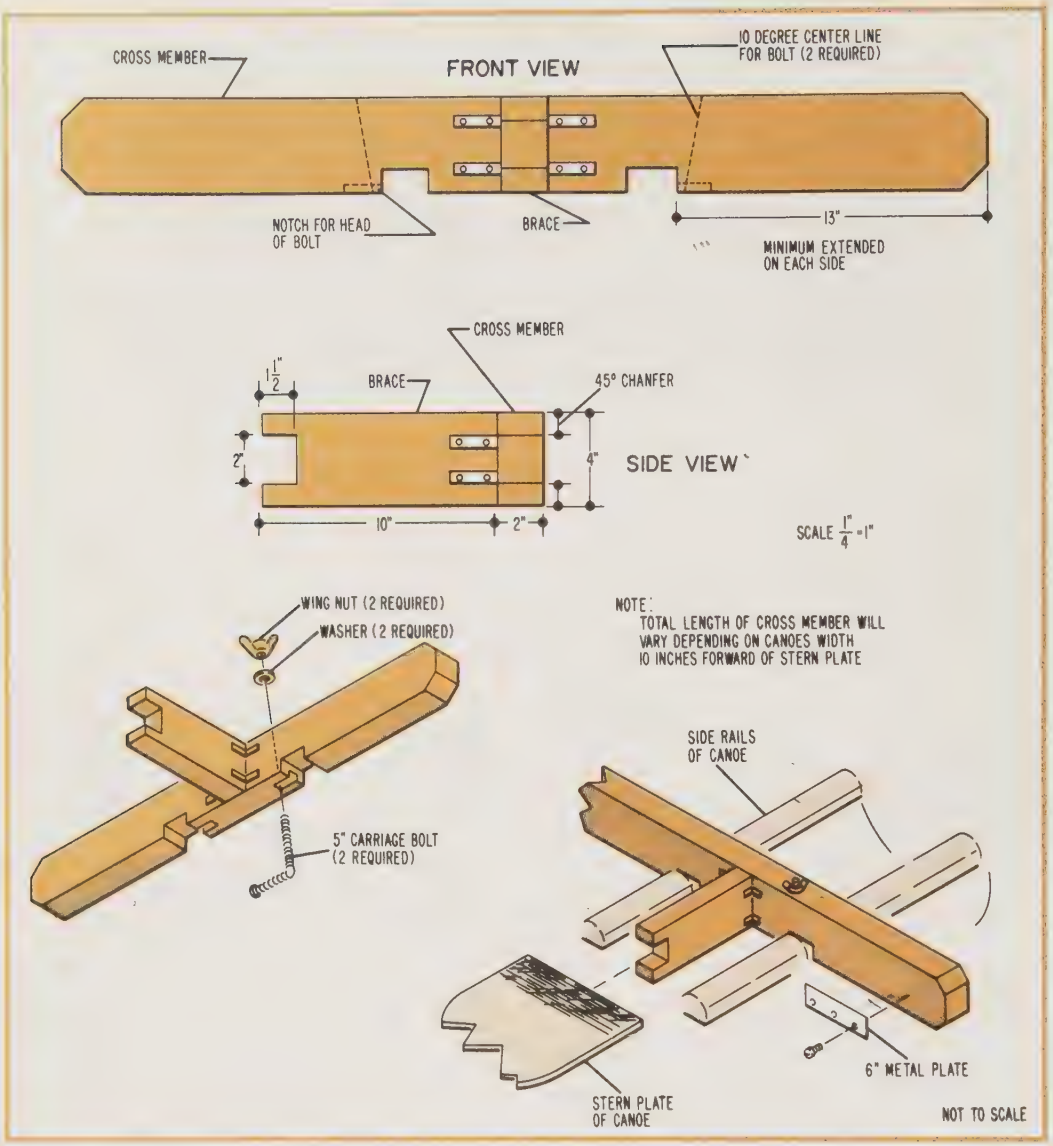
Mark the holes for bolts and start drilling from the underside of the cross member ½-inch in from the notched cut. Using a ⅜-inch boring bit, drill at an angle of about 10° toward the center.

Now take the two ¼-inch carriage bolts and place them in a vise, leaving the heads sticking up 1½ inches. Use a hammer to bend the shafts over to a 90° angle.

Insert the bolts into the cross member from the bottom side and center the angled portion of the bolts over the cutouts. Next hammer the bolts down into the 2x4 until they are flush with the surface. The grooves they form will keep the bolts from turning after they are tightened against the gunwale.

A brace connecting the cross member with the canoe's stern plate keeps the mount from shifting during use. To construct this part, first make a pattern out of a 12x4-inch piece of cardboard. Notch one end until it slips onto the stern plate and angle the other end until it meets flush with the cross member. Most canoes have a rope eyelet centered on the edge of the stern plate. If that's the case, simply cut the pattern to fit a little to either side of it.

Now cut the brace piece according to the pattern and position it on the cross member. Secure with several finishing nails and apply two corner braces to each side.



MATERIALS LIST

Quantity	Size and Description	Purpose
1	2″ 4″x3½′ top quality pine	cross member
1	2″ 4″x1′ top quality pine	brace
4	2″ corner braces and screws	
2	¼x5″ carriage bolts with flat washers and wing nuts	
1	6″ flat metal mending strap	

NOTE: Also need, exterior enamel or varnish, and finishing nails

Notching cross member 1-inch deep can be accomplished with a small electric saw.

With hammer, carriage bolts employed as brackets are bent to 90° angles.

The angled portion of the bolt is hammered into wood, forming 1/4-inch depression.

As shown, two corner braces will secure the brace to the cross member.

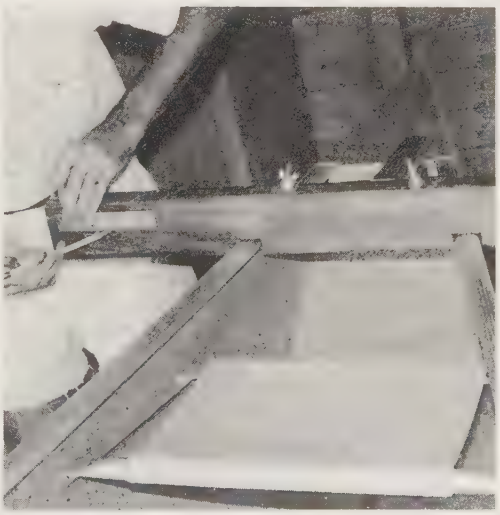
Some last minute trimming in the notched areas may be necessary before the completed motor mount will slip into position. This should be done before the mount is painted.

As constructed here, the mount will take a motor on either the right or left side. This is useful if both right- and left-handed people will be using the mount. Otherwise you may want to shorten the unused side 8 or 9 inches.

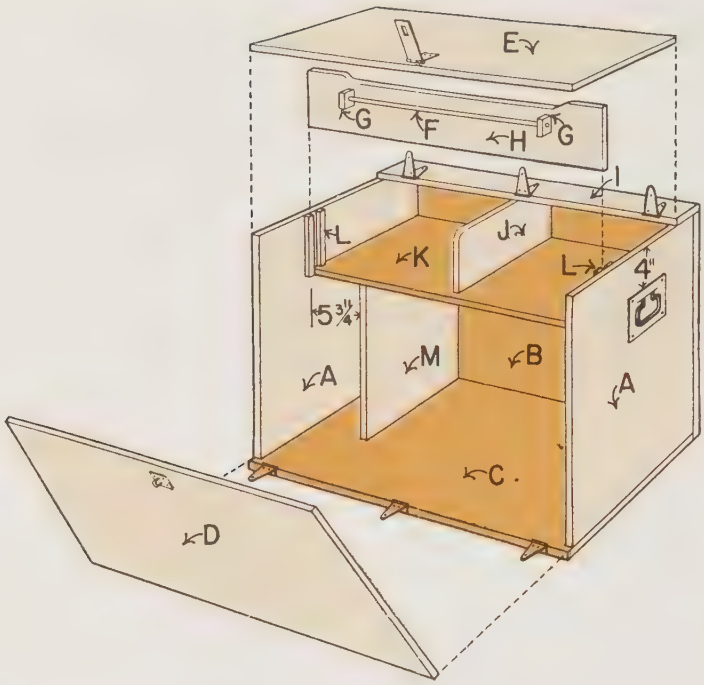
Add a 6-inch flat metal strap for the motor clamps to tighten against and follow with several coats of exterior paint or varnish.

Now clamp on a 1- to 3-hp motor and you're ready for some easy canoeing. M.H.

See also: MAINTENANCE, BOAT.



Note that the 6-inch flat metal strap is located where the engine clamps down.



A—Make two ¾"x16½"x18½". **B**—¾"x17¼"x30". **C**—¾"x19¼"x30".
D—¾"x16⅜"x30". **E**—¾"x15"x30". **F**—½"x20½" dowel.
G—Make two ¾"x1½"x2⅜" from scrap.
H—½"x5⅛"x28½" from pine shelving or plywood. **I**—¾"x5"x29⅞".
J—½"x5⅝"x15¼" from pine shelving or plywood. **K**—¾"x15¾"x28⅜".
L—Two each ¼"x½"x6⅜" and ¼"x½"x5⅝" from scrap.
M—¾"x10⅝"x15¾".

Cooking Convenience at the Campsite

This easily built chuck box will put all your cooking near at hand and remove much drudgery from camp cooking

BUILDING THIS CHUCK BOX can contribute to everyone's camping pleasure as it gives you convenient compartments for cooking utensils, dishes, canned goods and various food containers. The top folds down to provide easy access to the items most frequently used. The partition which holds the cups lifts up and out also. When the front is open, it provides generous tabletop work space. And, too, it is easily carried, having handles on each side.

In two or three evenings, anyone with average workshop skills should be able to complete the project.

outdoor furniture: see furniture, outdoor

Cooking Convenience at the Campsite *1781*

First, assemble all needed materials given in the accompanying list. Cut out all parts to the dimensions indicated. You will note that there are no complex cuts involved.

Assemble all wooden parts with waterproof glue and finishing nails. Attach chains to the drop front and a single one to the left-hand side of the lid. The bracket holding the towel rack may be installed as illustrated. Or, if you prefer, merely substitute screw hooks. Simply drill small holes in each end of the dowel so it fits over the hooks.

Sand the completed unit, use wood filler where necessary, and finish according to your taste.

Original design by Steve Ellingson.

See also: CAMPING; CAMPING EQUIPMENT; HIKING; OUTDOOR LIFE; OVENS.

MATERIALS LIST

Quantity	Size and Description	Purpose
1	3/4″ 4′x8′ exterior grade fir plywood	parts A, B, C, D, E, G, I, K and M
1	1/2″ 12″x36″ pine shelving or plywood	parts H and J
1	1/2″x24″ dowel	part F
2	4 1/4″x5 1/4″ drop handles	
3	18″ link chains	

NOTE: Also need 6″ hasp, strap hinges, T-hinges, 4d finishing nails, waterproof glue, sandpaper, wood filler and finish coating.

Portable Flameless Cooker

For camper, trailer, boat or cabin, this table top version of the old bean hole oven will add a note of convenience to any outdoor trip

NOTHING STARTS OR ENDS a camping day better than digging into a good hot meal, but who wants to stay behind to prepare it?

Well, if you are camping in cabin, camper, trailer or boat, where space and weight are not critical, here is a tried and true gadget that will neatly solve at least part of that problem for you. It is called a flameless cooker by some, a fireless oven by others, but most will recognize it as a sort of tabletop version of the old bean hole. Call it what you will, the results are the same: assurance that your food will be done on time, and with nobody losing out on fun because he had to cook.

The principles of operation are simplicity itself. A hot but uncooked, tightly-lidded pot of food is sealed in a confined space with a source of heat. The cook then forgets about it. A number of hours later (preferably at mealtime) the pot is taken out, opened, and the confined heat has done its job. The food is piping hot, thoroughly done, and succulent as only stewing in its own juices can make it.

Needless to say, a flameless cooker cannot be used to cook everything, nor is it a panacea for all mealtime problems. But it can save you a lot of time and trouble on stews, oatmeal, soups, vegetables, any kind of boiled or stewed meats and similar foods.

The accompanying sketch shows all the building details. The box is a matter of taste and can be built of anything at hand. An inexpensive Styrofoam ice chest or discarded cold drink box would make a fine shell. Although any kind of insulation can be used, Styrofoam or regular batt-type insulation will probably prove to be the best. Whatever you use, there should be at least four inches of it all around the pot and it must not be compressed.

The pot itself should have a tightly fitting lid, be about as wide as it is tall, and just slip into the cardboard tube. Unless the insulation you are using has a vapor barrier on it, line the entire inside of the box and lid with building paper or polyethylene sheeting.

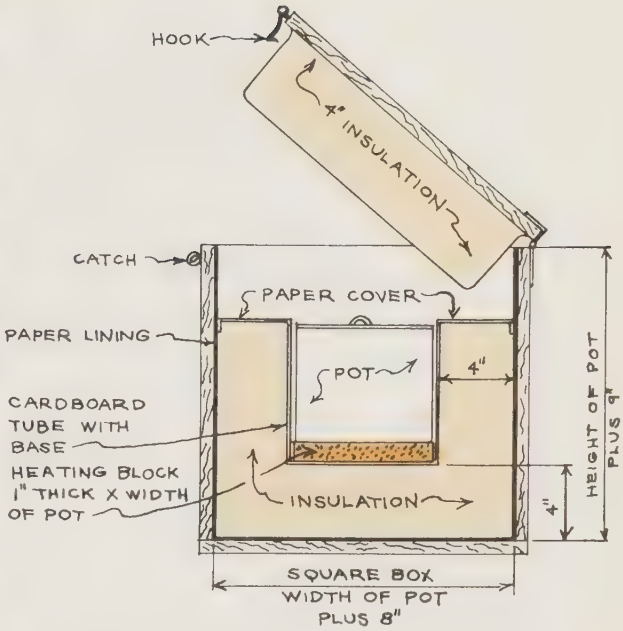
Be sure the insulation on the lid fits snugly in the box and down on top of the pot when the box is closed. Any air spaces left are just so much wasted heat.

The heating block can be stone, tile, brick, solid metal, reinforced clay or concrete—anything that will hold heat but will not crack from thermal stresses. Attach a wire to the block so that it can be easily installed and removed from the bottom of the tube.

There is nothing like experience to teach you how to use your flameless cooker. In fact, experimentation is absolutely necessary before you can use it effectively. The basic points are: have the heating block hot and the food boiling; transfer the block and

Portable Flameless Cooker 1783

Heating block can be almost any material that holds heat and will not crack.



Construction details of the flameless cooker with batt or granular insulation.

Next into the tube goes tightly lidded pot about as wide as it is tall.

pot from stove to box and close the box as rapidly as you can so that as little heat as possible is lost; and have the pot full so that the heat does not get wasted on dead air. Observe these rules and your flameless cooker should be ready to go to work.

See also: CAMPING; OUTDOOR LIFE; OVENS.

Top insulation goes in next and quickly so that a minimum of heat is lost.

Improvising Cooking Rigs at the Campsite

You can assemble these makeshift appliances from anything you have lying around at almost no cost whatsoever

ON THE BEACH you can make a quick hot dog-roaster (1) by filling a metal bucket two-thirds full of dry sand and pouring in enough white gasoline to soak in without any standing liquid. Gives a hot and safe flame.

For a more elaborate roaster (2) punch air holes in two sides of a five-gallon gasoline can, cut out top (on broken lines), put about three inches of sand in the bottom, and use with charcoal fuel.

For an outdoor oven (3) use a five-gallon gasoline can with a tin door hinged on the top and fitted with a simple latch. Set close to fire against a bank, or pile of stones, and pack with dirt or sand for insulation.

Another use for the five-gallon gasoline can (4)—this time with a stovepipe and draft door. Cut pie-shaped pieces inside a circle slightly smaller than a 4-inch stovepipe, bend the strips up and fold over a sheet-iron collar to fit inside the stovepipe. Use a one inch layer of sand inside to bed your fire.

Bind your skillet handle (5) to a long stick, rest one end in the crotch of a branch stuck in the ground, the other end under the hook of a second branch. When eggs are fried, swing the skillet away from fire, and hook the stick under a third branch, as shown.

If your grid is fairly sturdy and its bars spaced closely enough together, you can set up a broiler (6) for fish, fowl or roasts against a pile of rocks. This arrangement prevents basting fat from dripping onto fire.

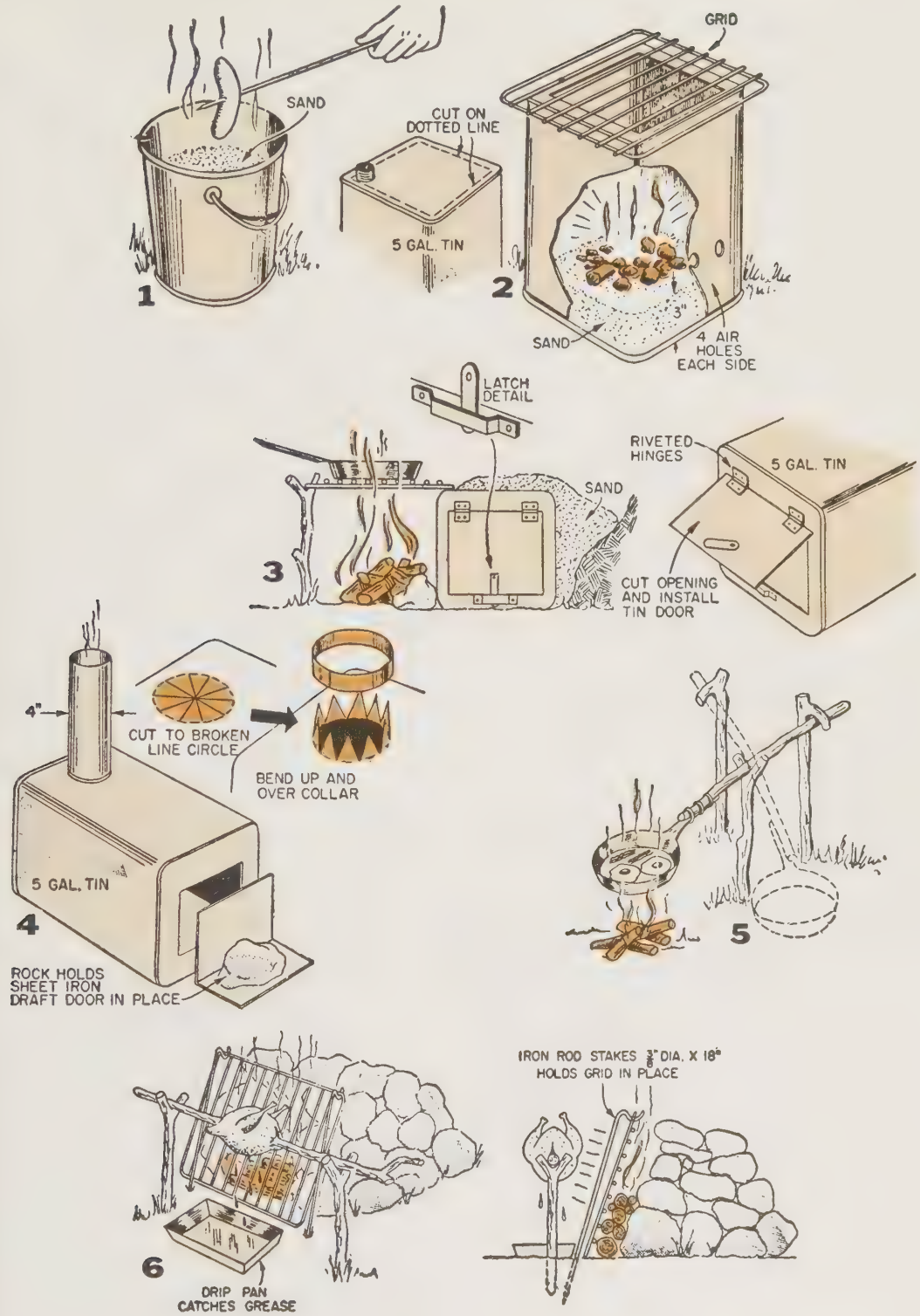
Two types of easily-made grids (7). If available, welded steel mesh screen can be substituted for the metal lathe.

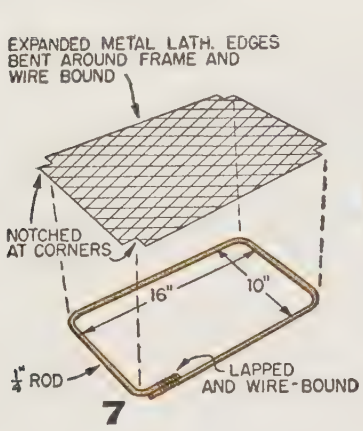
Three handy tools (8) made from the end of that broken bamboo pole. The tongs will handle coals and light objects.

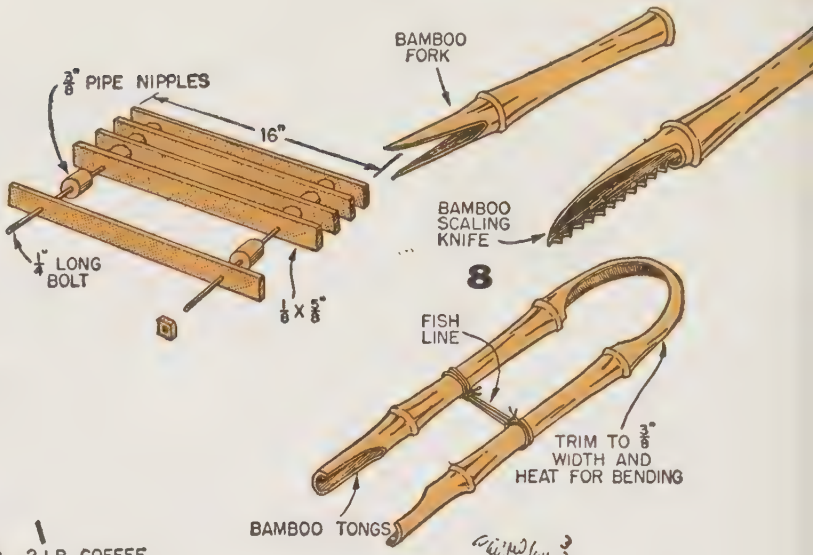
Keep your perishable foods cool (9) and out of reach of animals. Cut out an opening in one side of a five-gallon gasoline can, cover all other sides and top and bottom with monk's cloth, and hang a loose flap of the cloth down the front, pinned with safety pins. On the top of the can, set a two-pound coffee tin filled with water and having four wicks attached through holes punched in its circumference. The wicks are then sewed to the monk's cloth. You'll be surprised at how cool the food will keep. Hang in a shady spot where there is a good breeze, and refill the coffee tin with water as required.

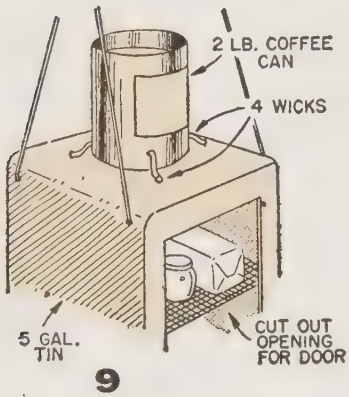
Dissipating heat through evaporation, a box (10) of galvanized sheet iron with riveted hinges, and with a sheet of monk's cloth thrown over it when closed, will keep butter, eggs, milk and meat at temperature

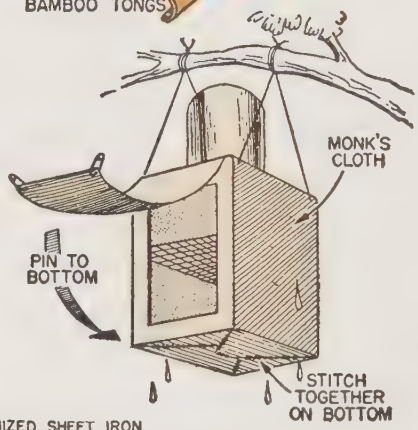
Improvising Cooking Rigs at the Campsite 1785

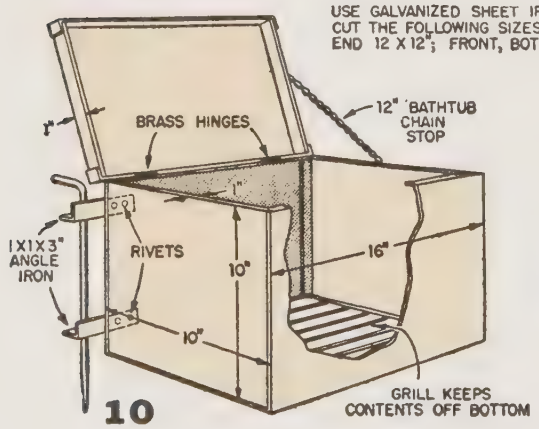


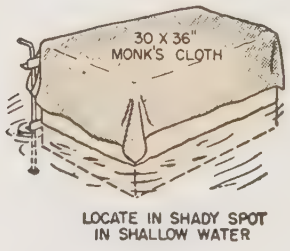












of surrounding water, or lower, no matter how hot the day. An iron stake pivoted at one corner of the cooler lets it move up and down (do not load so heavily it sinks completely), but prevents it from tipping over. Locate in a shady spot in shallow water.

See also: CAMPING; CAMPING EQUIPMENT; CRAFTSMANSHIP; HIKING; OUTDOOR LIFE; OVENS.

Living Off the Land

With a few manuals and some basic information, you are well on your way to reaping in the bonanza of food surrounding you in the wilderness

ODDLY, FEW CAMPERS avail themselves of the bonanza of food that surrounds them in the wilderness. Many feel that they would be unable to identify edible items, and others just never think of it. But it is actually something everyone can, and should, try. A fundamental knowledge of what may be gathered and eaten could sometime be a life saver, and meanwhile it is a lot of fun and good eating.

The first thing one must learn about gathering wild foods is caution. You cannot just go out into the woods and start eating anything and everything with abandon, for certain plants *are harmful.* This does not mean that you have to give up the idea out of fear, for there are dozens of good reference books in libraries and stores that teach you easily how to know good from bad.

Probably the area where greatest caution should be used is in gathering mushrooms. There are many false ideas about mushrooms. Many country people have been indiscriminately gathering numerous varieties for years, but they are lucky they have come to no harm. Some claim cooking mushrooms with a silver coin in the skillet will warn you if they are poisonous, the coin turning black if they are inedible. This is strictly an "old wives' tale." The best way to go about the mushroom problem is to get a good reference book and bone up on them.

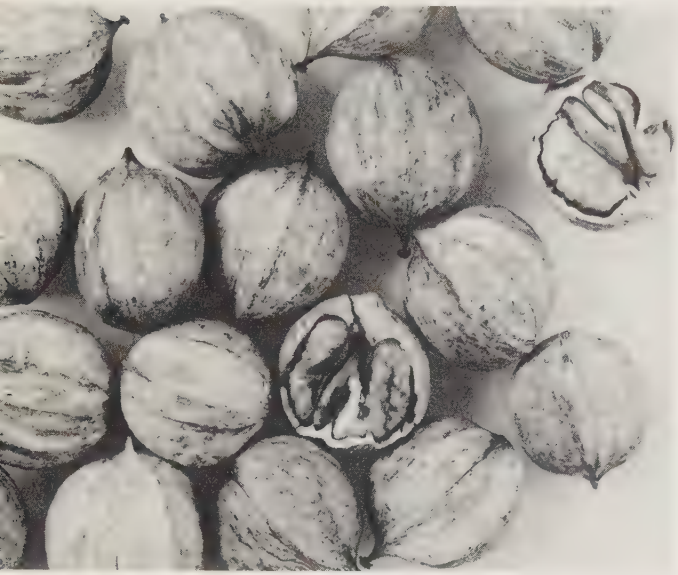
You will soon find that certain varieties —the morel, for example, of which there are several varieties—are easily identified, and look like no others. The shaggy-mane, a fall mushroom, is another species that has no inedible varieties even remotely resembling it. And, the big white puffballs commonly found in meadows are also easily identified and edible.

Thus, in the area where you will do most of your camping and mushroom hunting, thoroughly learn the identity of one or two edible varieties, and stick to those, foregoing all others regardless of how great the temptation. Montana is rich with morels, and picking over 500 of them during a single week is not uncommon. Hundreds of other types of mushrooms are everywhere, as well.

In northern Michigan you can also gather morels by the bushel. There they usually appear in mid-April, and the maple woods is one of their favorite haunts. Up there, you can also find large white puff-

outdoor lighting: see lighting
outdoor speakers: see stereo
outriggers: see trolling techniques
oven, microwave: see electronic cooking

balls. These, when so fresh the knife squeaks as you slice them, are excellent when sliced in slabs a quarter-inch thick, peeled (the tough outside comes off easily) and sauteed gently and lightly in butter. Never use any that show brown spots inside, as this indicates they are past their prime.



Mushroom gathering is a rather specialized "free food" hobby but, fortunately, there are scores of other items in the woods. Suppose, for example, you are in northern Michigan, fishing the famed Au Sable and decided to stay overnight in the woods by the river bank. The only trouble is that your food supply consists merely of a small square of bacon and a few crackers, plus some coffee and salt.

If the fishing is poor, try combing the swampy portions of the stream bank. You should find marsh marigolds—some call them cowslips—in abundance. The big green leaves should be tender and juicy. Simply stock up on these and bring them back to camp.

Start a fire and put on an iron kettle containing a bit of water to which the small hunk of bacon is gently simmered. Toss in heaps of these fresh marsh marigold greens and more water. When these are boiled with

The shagbark hickory nut is in abundance in the U.S. and provides a nutritious, tasty snack.

An unlikely suspect for life-giving nutrition, the prickly pear cactus is covered with sweet fruit which can be eaten fresh or made into jelly.

The shaggy-mane mushrooms are edible and can be identified by their cap, 1½ to three inches long, and stem, two to four inches long and four to six lines thick. It is usually yellowish or darker, and the cap is oblong, bell-shaped, not fully expanding and fleshy at the center. It appears in the spring and fall, sometimes solitary but also in groups, usually in rich soil.

Morel mushrooms, also known as sponge mushrooms, are from two to four inches high and about 1½ to two inches broad. The cap is ovate or oblong, deeply pitted, dingy yellow or tawny. The stem is one to two inches long, stout, generally hollow and whitish in color. These plants are edible and serve as a delicious addition to any meal.

the bacon and its juices, the result is a delicious sauce.

You should also be able to find leeks almost anywhere. The leek, as you may know, thrusts up early in spring, its narrow green leaves giving away the location of the white, onion-like stem and bulb beneath the rich forest soil.

Leeks taste like a cross between onions and garlic. Used sparingly, they are delicious, so slice tiny bits and drop them in also. Just before serving the hot greens with their bacon flavor sprinkle a few bits of raw leek over them. With the crackers and a pot of black coffee, you'll have a dinner fit for any gourmet, with practically all of it taken from the wilderness surrounding you.

Leeks can also liven up a green salad. Farther south, wild onions or ramps serve just as well. Young shoots of wild grape vine are also good in a salad. And watercress for which you would pay dearly in any market, is commonly found along streams where campsites are located.

There are a great many other common, edible plants that can be used in salads and for greens. The dandelion is one of the most common. It grows almost everywhere, and can be gathered safely and easily. Greens are made just as with any other plant so used. A bit of bacon or ham to cook with them adds the crowning touch.

Again, the best way to learn about various edible plants is to study books that list many of them. Survival instructions issued to service personnel are also good sources of information. Numerous camping volumes also give lists of wild foods.

Books about how various Indian tribes

lived often give good and unusual hints about free camp foods. For example, many tribes commonly boiled or roasted the tubers of water lilies. These are much like potatoes. New maple buds were used by others as a kind of salad. Fresh maple sap, when it runs in the spring, makes a wonderful, sweet drink just as it comes from the tree.

Indians, and many a pioneer, made flour from oak acorns, using it for pancakes or in a simple bread. Tannic acid, which makes acorns somewhat bitter, was leeched out by soaking, then the acorns were dried and ground. In the fall, Indians made a regular festival out of gathering wild nuts, and campers still can do that today. All common nuts are edible. The small three-cornered beechnuts, which are found several to a burr, are delicious when eaten right from the husk, and still better when incorporated abundantly in camp bread, cookies, and biscuits. Walnuts and hickory nuts are found as top prizes in many areas, and in the west the excellent and delicately tasty pinon is tops.

Such examples of foods that are free for the taking around your campsite, and ways to utilize them, are endless. But of all free foods, the wild fruits are undoubtedly most common and varied. It is in this category that most average campers will find the greatest pleasure and the greatest amount of good eating.

Wild fruits also come at that time of year when the greatest number of campers are in the woods. If you get to know a lot of different varieties, you soon discover that there is some item to be added to your camp menu almost all summer and even into the fall. With a bit of knowledge and some ingenuity, plus some work that turns into fun and satisfaction for all hands, you can supply the camp dessert, from fresh fruit to pies to jellies and preserves, the whole summer long right from the country in which your tent is pitched.

One of the most common and most delicious wild fruits is the wild strawberry. Try fresh fish broiled or pan-fried in camp, with a heaping bowl of ripe wild strawberries to top it off. The wild strawberry is a shy thing. It grows best when hidden deep in grasses in the shade of birch or aspen, so the best berries do take a bit of seeking. They are worth the effort.

Then there is the juneberry, or serviceberry. This shrub grows in many areas of the U.S. from east to west. It blooms very early, the bushes or small spreading trees thick with white blossoms long before leaves appear. Almost nobody utilizes the dense crop of reddish-purple berries that bend the branches later on, usually from late June to early August.

There are, in fact, many other common fruits not usually used that are excellent camp (and home) fare. Blueberries are well known. East them fresh, or use them in a simple cake, larded so full of them that it turns purple as it bakes in a reflector oven.

Wild blackberries and wild red raspberries are also very common, and the open pine and poplar woods often have wagonloads of huge blackberries going to waste. They are invariably sweeter and juicier than those found in markets.

There are other wild fruits not as well known, but just as delicious. One of these is the sand cherry. This fruit is a true cherry, but it grows on a "tree" seldom more than two feet high, located in sandy dunes with some grass on them, such as along the shores of northern Lake Michigan. These cherries are of fair size and dark in hue. Pitted and used in pies and cakes, they are excellent.

From cherries alone, you can make sand cherry jelly, chokecherry jelly (and chokecherry syrup to use on pancakes), wild black cherry jelly, and wild red pin cherry jelly.

You can carry the wild fruit idea much

The wild strawberry of the Rocky Mountains is good-tasting fresh or in jam. It grows in abundance in the Rockies and is just one of the many edible varieties of wild strawberries.

The wild growing dandelion is the most common addition for a green salad. When cooked with a bit of bacon or ham, this garden nuisance can be a savory treat.

farther. There is no region of the U.S. that does not, at some time of the camping season, have some varieties of wild fruits for the taking. In Texas, you can pick agarita berries and make wonderful bright-red jelly. Prickly pear jelly is made from the purple fruits of prickly pear cactus and the small strawberry-like fruit of the *pithaya cactus* that grows close to the ground is great fresh or in jelly.

Also try the super-sweet, black fruit of the small *scrub* persimmon, and the gold-purple fruit of the large, wild persimmon tree. In West Virginia you can pick many of these and find them good both raw and cooked. For a bigger treat, pick them after the frost has hit them. In the Great Lakes and New England, no good camper overlooks the so-called highbush cranberry whose clusters of bright red, shiny fruits hang lush in the fall. These are a favorite food, incidentally, of ruffed grouse, and the best time to pick them is during bird season. They make excellent preserves.

These are a few hints on what you may find free for the taking as you camp, and a few suggestions as to how to use them. Work at it and you will discover many more.

See also: CAMPING; CRAFTSMANSHIP; DIRECTION FINDERS; FISHING; HIKING; HUNTING; OUTDOOR COOKING; SURVIVAL; WILDLIFE.

▲ *Use of foil eliminates the need for toting many varied cooking utensils. Above, heavy-duty wrap is a substitute for the skillet in a steak fry.*

◀ *Shaped metal "paper" becomes reflector hood for keeping biscuits warm. Always place shiny side toward the food.*

Campsite Cooking with Foil

While many ardent camp cooks frown on the use of foil, it is lighter in your pack than dozens of utensils, it is disposable, and most important, it is highly versatile

MOST CAMP COOKS of the old school sneer at the mere mention of foil and foil cookery, while a few grudgingly concede that aluminum foil has some merit in backyard cooking or hobby cooking. These concessions are usually accompanied by such a disdainful sniff that the beginning camp cook might hesitate to sneak the aluminum foil out of the kitchen drawer and into the camp pantry, lest he be considered some kind of nut by his fellow campers.

Imagine then, the poor cook's bewilderment when he comes upon the purple prose of the aluminum addicts who emphasize the elimination of carrying and cleaning all bulky utensils. They devote page after page to drawings and directions for all manner of do-it-yourself pots, skillets, cups, and so on, with detailed instructions on how to fashion the framework from green forked branches or wire coat hangers.

While it is true that the foundation of a good camp kitchen is a nested set of cooking utensils, there should also be some fun in camp cooking. Ingenuity and spur-of-the-moment improvisation is the spice that takes the hum-drum out of cooking three squares a day with limited equipment. So, an economy size roll of heavy-duty foil is equally indispensable. With this flexible yet sturdy foil, you can fashion a reasonable

facsimile of almost any utensil that would ordinarily be considered excess baggage, but which you may suddenly decide to use.

It is almost absurd to lug a muffin tin along on a camping trip, for instance. But if you happen upon wild blueberries, and get a hankering for blueberry muffins for breakfast, there's no problem. Just mold squares of foil over a suitable size can or cup for individual baking cups, follow the directions on "the bakeshop in a box," and pop the muffins in the oven!

A colander is equally as bulky and used as seldom as a muffin tin, but handy if you decide to cook spaghetti or macaroni. You can, of course, drain off the water by tilting the kettle, using the lid to keep the pasta in the pot where it belongs. Unfortunately, spaghetti has a disconcerting way of slithering out along with the cooking water when drained in this fashioned, so a double thickness of foil shaped over a bowl and punched with small holes serves admirably as a camper's colander. It takes only a minute or two to create while the pasta is cooking, and ensures the main portion of your meal ending up as you intended.

Wood fires for cooking are becoming more and more a thing of the past, especially in organized campgrounds. Even in wilderness areas where firewood may be plentiful, a dry spell may preclude all open fires because of the fire danger. For this reason, every camper these days has some sort of stove with him.

Even with the most sophisticated of these cooking facilities, foil does play an important role as cook's assistant. Camp ovens are usually smaller than the ones in home kitchens, and it seems silly to take up precious storage space with special baking sheets and pans when they can be so easily improvised when needed. Foil makes an excellent pastry cloth when preparing pastry turnovers or biscuits, and the same sheets of foil can also be used as the baking pan.

In many of the nested cooking kits, the skillets serve double-duty as pot lids, which is fine when creating a one-dish meal. However, when you are cooking up a storm, you may need that handy roll of foil to improvise extra lids for skillet or kettle. It is a simple matter to mold a square of foil down over the utensil in question.

With the smaller camp stoves, you may occasionally do a bit of pot juggling, especially when cooking meat, potatoes, and vegetable separately. The first food off the stove will keep appetizingly hot if wrapped tightly in foil while the other foods are being cooked.

There is also the novel art of cooking while driving, using the engine manifold as a source of heat. While this type of cooking en route is reserved strictly for the cooler months of the year, the summer camp cook with limited burner space can utilize the heat from the engine *after* a long day's drive. If you have ever opened the hood of the car at such a time, it is needless to stress the importance of heavy gloves as you use this makeshift "oven." Wrap brown 'n' serve rolls or French bread in two separate overcoats of foil, using the drugstore wrap, to keep hot engine fumes from permeating the baked goods. Then hang the package on the manifold with a coat hanger while you prepare the rest of the meal.

While on the subject of hot crusty French bread, you might want to try a flavor variation. Blend one envelope of onion soup mix with ½-pound of softened (not melted) butter or margarine, and spread between the deep slashes you have cut in the French bread. Wrap in foil and heat—on the grill, in the oven, or on the manifold. This same onion butter is great on corn on the cob as well. Spread it liberally on each husked ear before wrapping in foil for roasting.

One ingenious camper has used aluminum foil in a most original way. The camp stove at one stop had a two-foot plate for a cooking surface, and it was adequate for a heavy cast iron griddle. However, the heat

from the stove was too intense for the thinner aluminum cookware, and stews and soups tended to scorch. Since there apparently was no way of controlling the heat *within* the stove, it was controlled *above* the cooking surface by setting each aluminum pot on four thick wads of aluminum foil.

The home economists at one foil company came out with another great suggestion for those of you who have a camp oven —a beef roast straight from freezer to platter in three hours without thawing. Pre-heat oven to 400°, then turn back the heavy duty foil in which the four pound rolled beef roast was frozen. Sprinkle the meat with salt and pepper and re-wrap the meat loosely, leaving the top and ends open partially, to allow the heat to circulate. Place the meat in a shallow roasting pan which has also been lined with heavy duty foil, and roast for 2½ hours. Then turn the foil back from the meat completely and allow it to brown for another ½-hour at the same temperature—a total of three hours, or approximately 40 minutes per pound.

These basic instructions might have to be varied somewhat if the roast was taken from your home freezer and kept in the camp refrigerator or cooler during a day's trip. A slight amount of thawing would probably occur during these few hours.

Foil can lend a hand in the refrigerator or camp cooler, particularly for storing leftovers to be reheated the next day. One favorite timesaver on a twosome camping trip is to prepare your favorite loaf for one evening, knowing you will eat half of it when it comes out of the oven. The balance is wrapped in foil and reheated the next night for about 20 minutes at 350°, still tightly wrapped in the foil so it will not dry out. In the meantime, prepare two generous servings of instant mashed potatoes, then blend in a good portion of grated cheddar cheese. Open the foil carefully and fold it back, then frost the meat loaf with the cheesy potatoes and leave it in the oven another few minutes, until the potatoes are lightly browned. A tossed salad or crispy raw vegetables, prepared while the main course is heating, and dinner is ready!

Of course, heavy duty foil really comes into its own with a campfire or a charcoal grill. So many have become excellent grill chefs that the one who is elected camp cook will usually find a way to include a small portable grill in the camping gear. The more elaborate patio grill may have a commercial gravel-type liner in the bottom, but a layer of foil, shiny side up, in the small grill will not only reflect the heat up onto the food, but save on the grill cleanup.

Any outdoor cook knows that wind has a definite effect on the cooking temperature of the fire, to say nothing of the smoke wafting into the chef's face. Since the portable grills seldom have elaborate windscreens or hoods, use doubled aluminum foil to provide wind protection and heat deflection onto the food. You can even improvise a complete smoker oven by forming a bowl-shaped hood that fits snugly around the edges of your grill. Cut a hole in the top of the hood for a vent to allow steam to escape so the food will brown.

Since each grill and each cooking situation is different, elaborate instructions on how-to-do-it are impossible to give. This is the kind of situation where it's much more fun to use your own ingenuity. Just remember that foil can be rolled at the edges to form a sturdy rim, and then the rim can be pressed down over the edge of the grill to form a tight seal. As you pull a piece of foil from the roll, look carefully at both sides—one is slightly more shiny than the other. Although some people never bother, you will find that the shinier surface placed toward the food will reflect a bit more heat onto the food.

If you enjoy hickory-smoked foods, but have been annoyed in the past by having the wet hickory chips burst into flame after they have been scattered on the coals, try

Campsite Cooking with Foil

Getting the most from one sheet of foil. Use as a work surface for molding biscuit dough. Then use as the base of a reflector oven.

Foil used as heat reflector on grill also eliminates major clean-up chore. Space between coals avoids drip flare-up.

this helpful hint. Wrap the wet hickory chips in tight packets of foil, punch holes in the top of the packets, and place one or two packets on the coals, punched side toward the food.

As a change of pace from the usual steak, chicken or hamburgers, you might want to feature sandwiches-in-a-bundle as the main attraction from your grill. If you are traveling through an area with a German heritage, look for a bakeshop where you can find old-fashioned pumpernickel bread in round loaves, and try to locate homemade German knockwurst in a nearby butcher shop and some fresh corn at a local farm stand. With a pound loaf of bread, combine a stick of softened butter with two tablespoons of mustard, ½-cup grated cheddar and three or four tablespoons of chopped chives (the dehydrated ones will do nicely). Cut the bread in 12 even slices almost to the bottom crust and spread the savory mixture liberally between every other slice. Wrap in foil and heat over hot coals for 20-25 minutes. Grill the knockwurst and corn, then unwrap the bread and cut through every other slice to serve bubbly hot cheesy sandwiches.

You might try the same procedure, buttering every other slice of a loaf of French bread with mustard butter, and inserting a slice of boiled ham or tongue, a slice of process cheese and a paper-thin slice of mild onion. When heated through, cut apart as above and serve with herbed baked tomatoes. Cut large beefsteak tomatoes in half, season with salt and pepper, and sprinkle each half with buttered crumbs to which you've added a pinch of basil or oregano. Place the tomato halves in a lightly buttered foil pan, cover loosely with a foil lid, and bake 15 minutes on the grill.

Old-time clambakes are fun when you have a whole crowd to pitch in, digging the pit, collecting seaweed and driftwood for the fire, perhaps even digging the clams, if you happen to be in the right spot. You can have the same delicious result in about half the time right from your grill or a hardwood fire burned down to coals by preparing individual clambakes in heavy duty foil.

On a two-foot piece of foil, arrange the traditional ingredients: a piece of chicken, a scrubbed potato, an onion, an unhusked ear of corn with the silk removed, half a dozen well-scrubbed clams and a small fresh-killed lobster. Pour in ½-cup of clam juice and seal the package with the drugstore wrap on the top and at both ends. Wrap each package in a second layer of foil, with the first fold turned to the bottom of the second foil covering. Place about three or four inches from the coals, and cook for about an hour, turning the packages three or four times during the cooking. Have melted butter and lemon wedges standing by when you open the packages.

A double overcoat of foil is always advisable if the packages are to be handled during the cooking.

If you have always been indifferent toward cabbage boiled in the usual manner, try cooking a small head in foil for a noticeable improvement in flavor. Cut out the stem end, wash and drain well, then place on a large square of doubled foil. Fill the cavity with butter, sprinkle with salt and pepper, and enclose the cabbage loosely in the foil, twisting the ends of foil together at the top. Cook slowly beside the coals until tender-crisp. For a Germanic variation, add crumbled bits of bacon and a sprinkle of caraway seeds.

Some foods steamed in foil are the better for a bit of browning near the end of the cooking time. Either place the packages directly on the coals until the contents begin to sizzle, or open the foil and brown closer to the coals on the grill. While all sorts of time tables have been worked out for this sort of foil cookery, they are still only guesstimates. So much depends on the heat of the coals, the amount of wind, the size of the packages, and even the size of

the pieces of food inside. Naturally, a large pot roast or a whole chicken will take considerably longer than a flat package of slivered carrots and celery. A whole cabbage will take longer than individual wedges steamed in foil.

On those now-rare occasions when an open fire is permitted, and when you find mineral soil in which you can build a pit fire, you can really have fun in the baking department with foil improvisations. Quick breads and biscuits can be baked on a grill over the coals with a makeshift reflector of foil hooded over the baked goods to direct heat onto the top at the same time that they are being baked by the coals below. In contrast to regular reflector oven cooking where you have a blazing fire about eight inches in front of the reflector oven, this procedure requires the coals a few inches below the biscuits or corn bread. There are any number of variations of this reflector principle from simple to complex. Actually, all you need to do is bend a double thickness of foil to form a half-hood. If you are fighting a strong wind, you may want to anchor it with a basic framework of small green branches. Meat or fruit turnovers can also be baked in this fashion, since they take kindly to fairly high temperatures.

Every outdoorsman worth his salt has heard of, if not actually concocted, beanhole beans and pit-cooked stews in a Dutch oven. A lot of people are not aware that you can pull delicious pies and cakes out of a pit too, even if you do not have a Dutch oven. Just be certain that the soil is not humus and contains no roots that could be set a-smouldering from your below-ground fire. Then dig a pit deep enough to hold a good bed of hardwood coals and of a size to hold a wire grill on the edges. Many campers improvise with an old refrigerator shelf or a bunch of stiff metal rods that they carry with them. In a pinch, sturdy green branches will serve the purpose. When your fire has burned down to coals, place the baking pan with your goodies on the improvised grid, and tent the pit with a domed cover of aluminum foil, shiny side down. Anchor the aluminum tent with rocks or clumps of soil to keep the heat in your oven, and check the progress halfway through baking.

Any of the packaged cake mixes or breads will behave well in this sort of oven. Just remember that chocolate requires a slightly lower temperature so that it won't scorch. It is not difficult to guess at the temperature of your pit oven with the old-fashioned hand method. Holding the palm of your hand at grid level, or as close to it as possible, count seconds slowly. If you can hold your hand in position less than three seconds, it indicates a temperature of at least 400°, three or four seconds is about 350°, while four to five seconds is 300-325°, about right for chocolate cake or brownies.

While these fun possibilities are accomplished with foil, do not forget that it is still a sometimes thing, and not necessarily a whole culinary way of ilfe. When there are other activities to entice you on your camping trips, the regular skillets and kettles let you get the cooking out of the way in a jiffy. And cleanup is never that much of a chore if you remember to start heating the water before you sit down to eat.

True, of course, foods cooked in foil do eliminate pots and pans in the dishwashing, but foil does present a disposal problem, especially in the wilderness areas. With camping ever on the increase, we can no longer recommend burying *any* trash *anywhere*. So, if you bring foil into camp, you had better plan on taking it back out again! Burn off any food particles that might have stuck to the foil, fold it compactly and stow it in a plastic garbage sack along with other unburnables until you can dispose of it in a trash can.

See also: CAMPING; CRAFTSMANSHIP; HIKING; OUTDOOR COOKING.

A Lightweight Back Pack Oven You Can Make

Most manufactured reflector ovens are too heavy for back packers, so if you are fussy about the weight of your pack, this no-cost four ounce, handmade oven is ideal

THE BACK PACKER needs good food for energy and morale. Having fresh pie, biscuits, hot rolls or cake for camp fare can do a lot for both.

Winding up a wilderness meal with warm cherry pie can make a rough day on the trail a pleasant memory. And if you're the type who can gain weight by merely reading a menu, it will enhance the flavor to remember that calories don't count. Another day on the trail will take care of them.

There is one hitch. To bake at a campfire, you need a reflector oven and most of them are too heavy for back packing. The lightest around weighs over 20 ounces, or the equivalent of six cups of flour. But, it is possible to make a handmade job that costs almost nothing, works well and weighs only four ounces.

As a back packer, you should already have a light wire grill. This will serve as a base. All you need in addition are two pieces of foil about 8 by 10 inches, three of those light aluminum, throw-away baking pans in a 9-by-12 size and 24 inches of soft wire about $\frac{1}{16}$-inch in diameter. With these materials, you can easily set up an ultra-light reflector oven that will bake anything from apple strudel to hot cinnamon rolls. It can be reused on subsequent trips.

The pictures and captions explain how it is done.

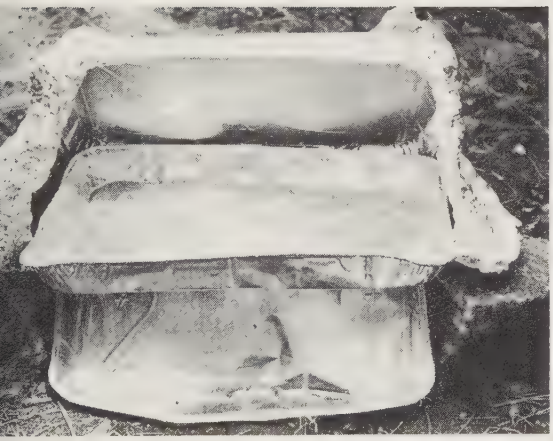
See also: CAMPING; HIKING; OUTDOOR COOKING; OUTDOOR LIFE.

overhead garage doors: see garage doors, overhead
overhead projector: see projector, overhead
oxalic acid: see finishing, wood
ozark depth finder: see navigation
pack frame: see hiking

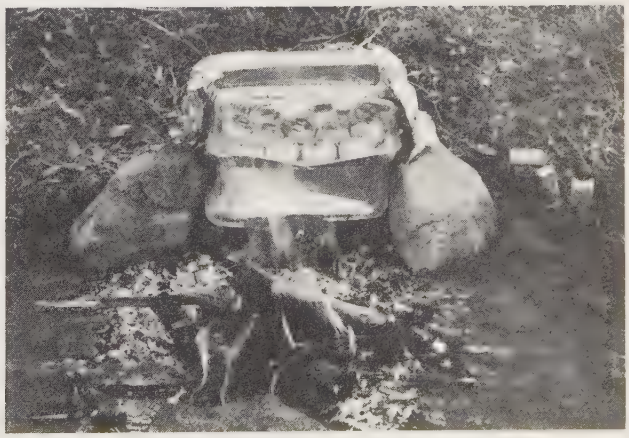
A Lightweight Back Pack Oven You Can Make

With small pieces of stiff wire—paper clips will do—join two aluminum baking pans of about 9 x 12 inches. The pans should be clean, but dents will not bother performance.

Attach stiff wire—a recycled coathanger is fine—to back pack grill and top pan. Top pan should be at about a 45 degree angle to grill, connections loose for easy packing.



Place grill between two rocks, place third pan on grill, add foil side reflectors. Bottom pan reflects heat up, top pan reflects heat down.



Add your favorite camp recipe and build a fire in front of oven. Reflector behind fire speeds baking. Oven can be used again and again.

Build a Pogo Stern Wheeler

This is not a deep-sea boat, but with its shallow draft and weed-proof propulsion system it's just right for exploring coves and bayous

THIS BOAT IS NOT suitable for navigating rough waterways, but with its shallow draft and paddle wheel propulsion system —no propeller to get fouled in weeds—it is ideal for exploring placid bayous close to shore.

It is build from marine-grade plywood and powered by a three horsepower used lawn mower engine that cost $15.

Pogo is quite simple to construct. The plywood provides the bottom, with some left over for the spray shield. The sides are two 6-foot lengths of 1 x 10-inch fir cut to the shape shown in the drawing. The transom is another piece of 1 x 10-inch fir, cut to a 47-inch length, and a beveled piece of 2 x 4 x 47-inch stock is used at the bow.

First assemble the frame, which consists of transom, sides and bow piece. Use waterproof glue and 1½-inch brass or galvanized screws at each joint. Then install the plywood bottom, using glue and Anchorfast copper nails. Note that the 48-inch wide bottom does not cover the full width of the frame. Center it on the transom and work forward, allowing the frame to project equally on each side. When you reach the bow curve, the bottom can be bent easily by soaking it with hot water and clamping it until the fastenings are in.

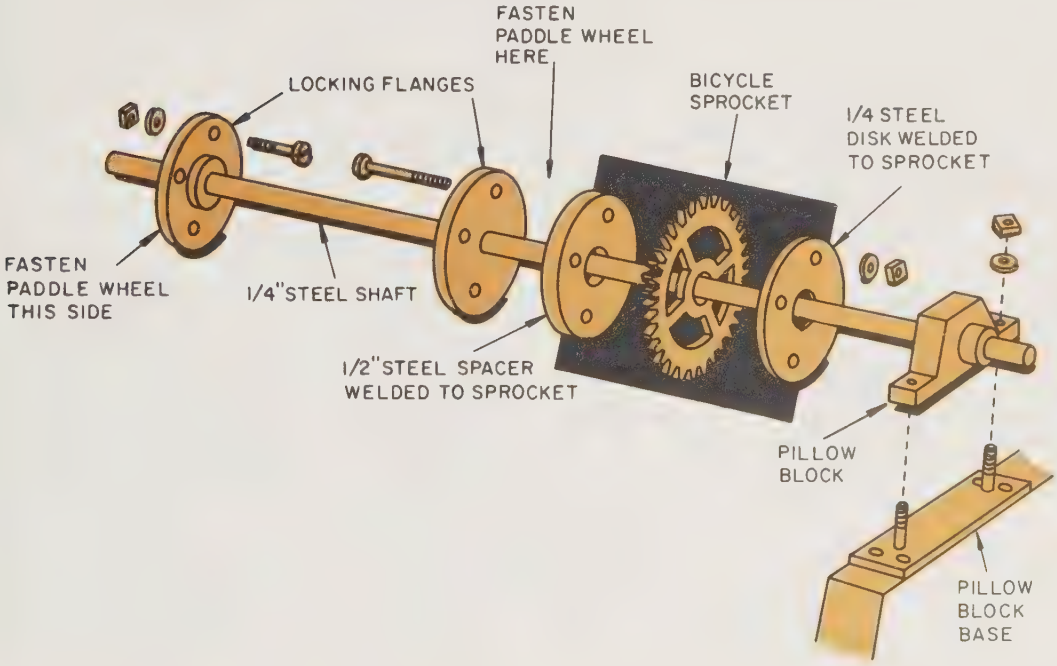
Next the reinforcing strips are installed on each side. These strips should project beyond the bottom panel so that their outside edges are flush with the frame sides. Use glue and 1¼-inch screws to secure the strips and, when the job is done, fill the recesses between the strips and the sides with calking compound.

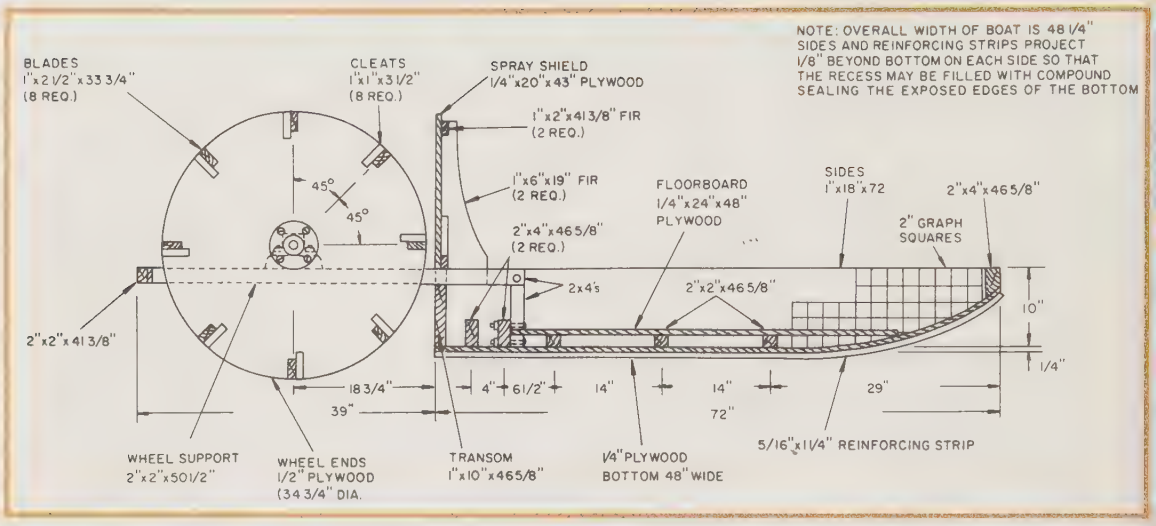
With the hull complete, the 2 x 4-inch

pad sander: see sanders

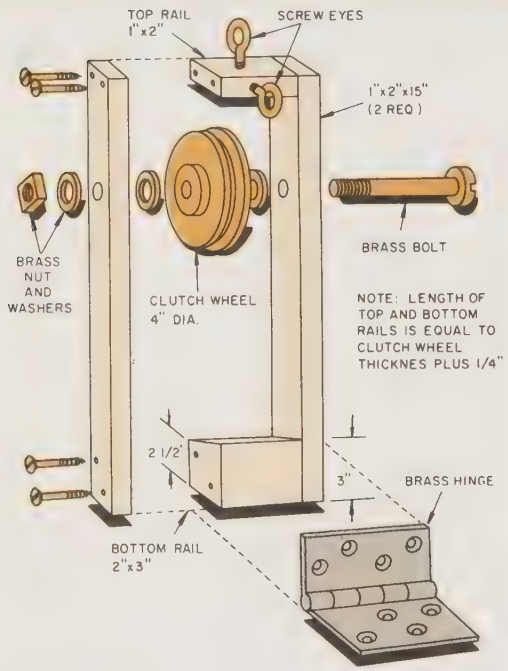
A junked lawnmower engine that cost $15 was overhauled and given the right angle drive. Note the clutch arrangement that tightens or loosens the drive belt. Including cost of new rings and gaskets, total for boat and engine was $50.

Detailed drawing of hardware used for the paddle wheel, including bicycle sprocket and pillow block.





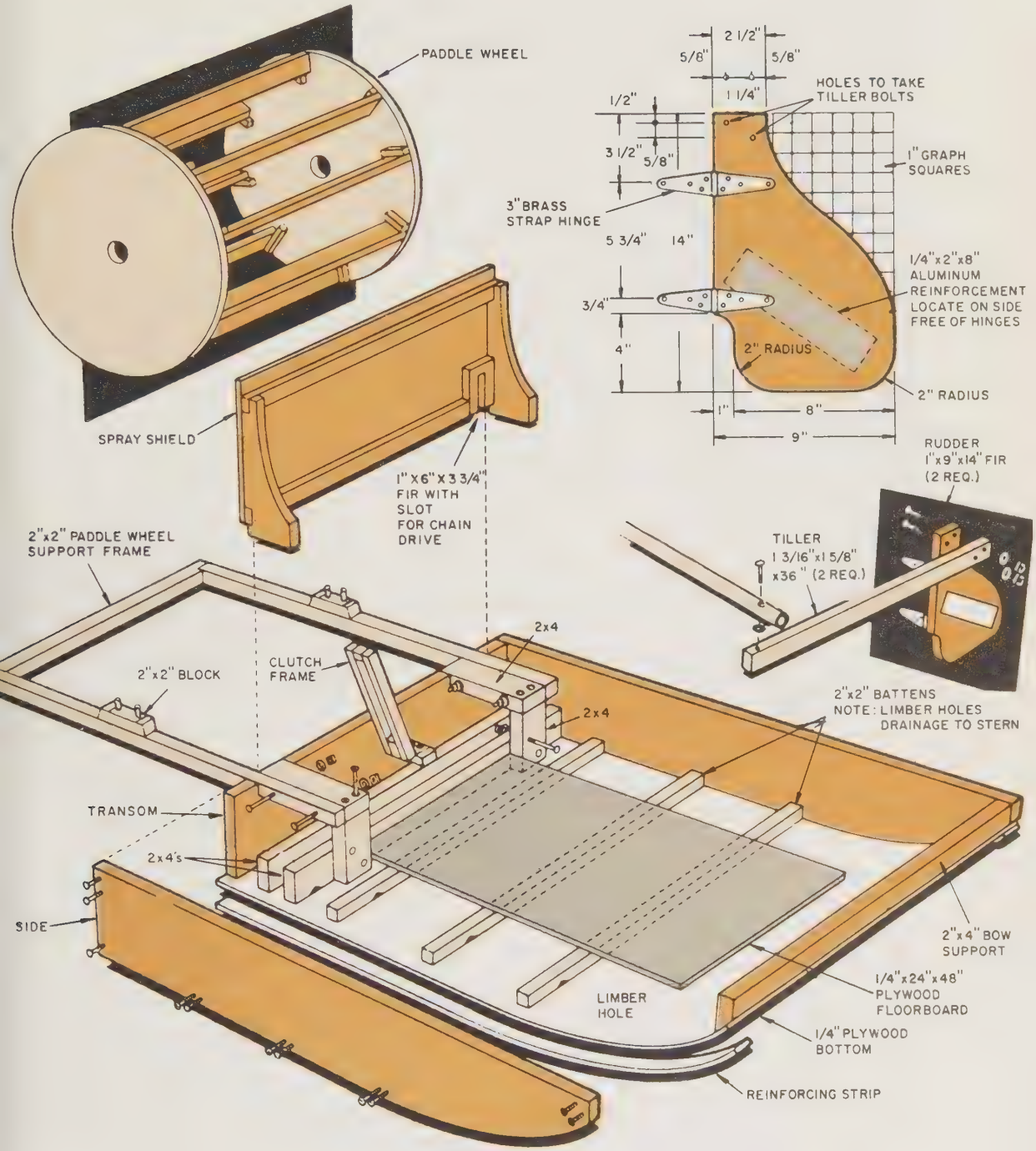
Longitudinal section detailed with measurements given for blades, cleats, wheel support and wheel ends, transom, etc. The overall width of the boat measures up to 48 1/4 inches.

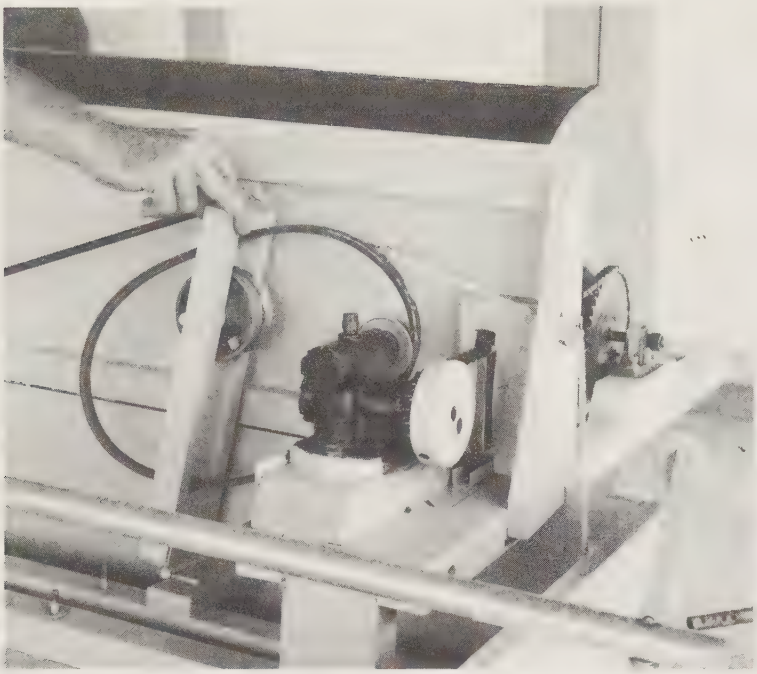


Illustrated here is clutch detail. Mounted between the engine and the gear, the clutch is basically a spring-loaded idler wheel operating inside a pivoting wooden frame, controlled by a steering cable passing through pulleys to bow.

The clutch control, as pictured here, consists of a rudder control cable connected through pulleys to the spring-loaded clutch assembly. The handle slips behind the eyebolt to hold clutch in proper engaged position.

Build a Pogo Stern Wheeler *1803*





The reduction gear is a right angle type; the bicycle chain passes from the sprocket on the paddle wheel through the spray shield. To decrease the speed of the paddle wheel and to mount the engine in the center, a series of reductions were used.

engine supports and the 2 x 2-inch battens are installed inside. First cut a ¼ x 1-inch notch about three inches from each end in the bottom of each piece. These limber holes will allow water to run the length of the hull and flow out through a drain which is later installed in the transom. The 2 x 4s are secured with glue, screws through the sides, and four extra-long lag bolts which are passed through from the bottom, and double as engine mounts. The 2 x 2s are simply glued and screwed from the bottom and sides. Notching the transom and installing the paddle wheel support frame completes the basic structure.

The circular end panels of the paddle wheel assembly carry eight blades spaced equi-distant around their perimeters. The blades, 1 x 2-inch fir, are set on 1 x 1-inch cleats for added strength at the joints. A detail shows the half-inch steel shaft assembly which passes through the middle of the wheel and terminates in pillow blocks mounted on the support frame.

To decrease the speed of the paddle wheel and permit mounting of the engine in the center of the boat, use a series of reductions. A 10:1 right angle reduction gear which came from an old riding mower in a junk yard was bought for $5. Between this gear and the paddle wheel, a 3:1 reduction was used.

This was accomplished by welding a sprocket to the output shaft of the gear and coupling it to the sprocket on the paddle wheel axle with a No. 41 bicycle chain. Between the engine and the right angle gear, a 2:1 reduction was used. Thus the total reduction is 60:1, which properly loads a Briggs-Stratton Model 6-S or equivalent engine.

For convenience, two engine controls are carried forward. A cable leads to a throttle control lever mounted on one side, and a simple single pole switch is installed below the lever and wired so the engine may be stalled by grounding out its spark plug to the engine housing.

The clutch is mounted between the engine and the gear and is essentially a spring-

loaded idler wheel operating inside a pivoting wooden frame that is controlled by means of a steering cable passing through pulleys to the bow.

A refinement here would be a rubber-faced brake mounted in conjunction with the clutch to prevent creeping when the clutch is disengaged.

Pogo is steered by dual rudders, has a spray shield which deflects paddle wheel spray, and a sheet plywood floor on which to sit.

Pogo operates in very shallow water, is efficient at low speeds and resists grass foul-up. At higher speeds, levitation occurs and results in loss of power, but since speed was not a prime objective, this is okay.

The paddle wheel ends are made of ½-inch plywood, and while the steel shaft used is ½-inch, it may be thicker, for at near flank speeds even a ½-inch shaft might flex. In some cases it may be necessary to utilize a channel, as a guide for the chain, to keep it from skidding off the wheel sprocket. The dual rudders extend an inch below the hull and are more than adequate for good maneuverability. The use of tilting rudders is suggested to avoid the danger of damaging them in shallow water, and there are no ribs across the bottom of the hull to catch and snag on vegetation. A through-hull fitting was utilized as the best method of draining the water, since Pogo remains out of the drink when not in use.

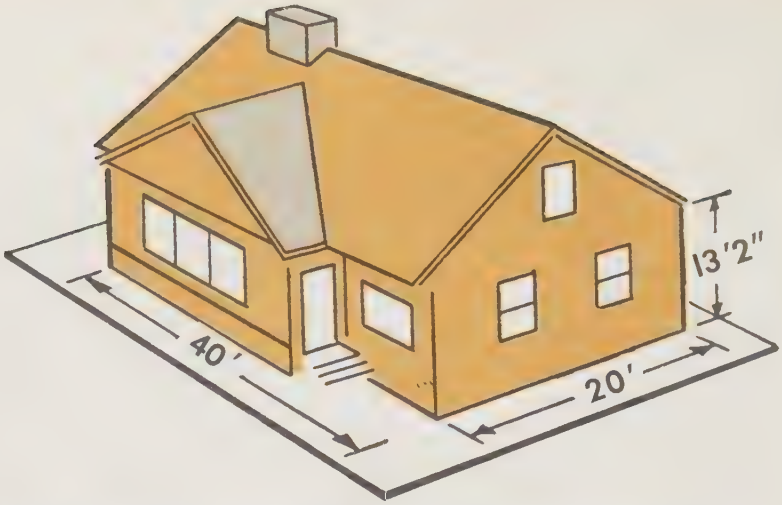
To make Pogo safer for two persons, make the 10-inch freeboard 12 inches and increase the boat's length by two feet.

See also: BOAT BUILDING; BOAT BUILDING PROJECTS; HULLS; LAND SAILER.

MATERIALS LIST

Quantity	Size and Description	Purpose
2	¼″ 4′x8′ marine plywood	bottom, spray shield, reinforcing strips and floorboard
1	½″ 4′x8′ marine plywood	paddle wheel end panels
2	1″ 10″x14″ fir	rudders
2	1″ 10″x6′ fir	sides
1	1″ 10″x4′ fir	transom
4	2″ 4″x4′ fir	bow piece and motor mounts
4	2″ 2″x4′ fir	bottom battens, wheel support frame rear member
2	2″ 2″x5′ fir	wheel support frame side members
12	1″ 6″x4′ fir	spray shield cleats, paddles and tillers
1	1″ 6″x4′ fir	spray shield supports and chain guide
1	1″ 1″x6′ fir	paddle wheel cleats and clutch frame
1	1″ dia.x54″ aluminum tubing	tiller yoke
1	½″ dia.x54″ steel rod	wheel shaft

NOTE: Also need lawn mower engine, paddle wheel hardware, caulking compound and waterproof glue.



Estimating paint needs is a matter of simple arithmetic. Multiply the distance around the house by the average height plus 2 feet. In this case, the total is 1800 square feet. Divide this figure by the number of square feet a gallon of paint will cover. At 500 square feet per gallon, for example, approximately 3½ gallons will be needed to cover 1800 square feet of wall surface.

How to Estimate Paint Requirements

An accurate estimate can save you dollars and ensure enough paint to get the job done

THERE ARE TWO FACTS you need to know to determine how much paint you need for the job at hand. As some paints are quite expensive because of the oils and resin used in their makeup, a little time spent in estimating can save you dollars.

This does not mean that you should skimp—far from it. Doing the exterior of your home is quite a job, and you want the work to last without undue fading, peeling, or flaking. Therefore, you want the best product you can find.

Measure the square footage to be painted. Divide this figure by the spread rate of the paint you have selected. (Spread rate simply means the average number of square feet you can cover with one coat.) Most manufacturers state on the label the coverage you can expect from their paint.

A lot depends on the condition of the surface to be painted. If it is porous, rapid absorption of oils, resins and pigment can cost you money. It would be far wiser here to purchase the recommended sealer or primer mated to the paint of your choice.

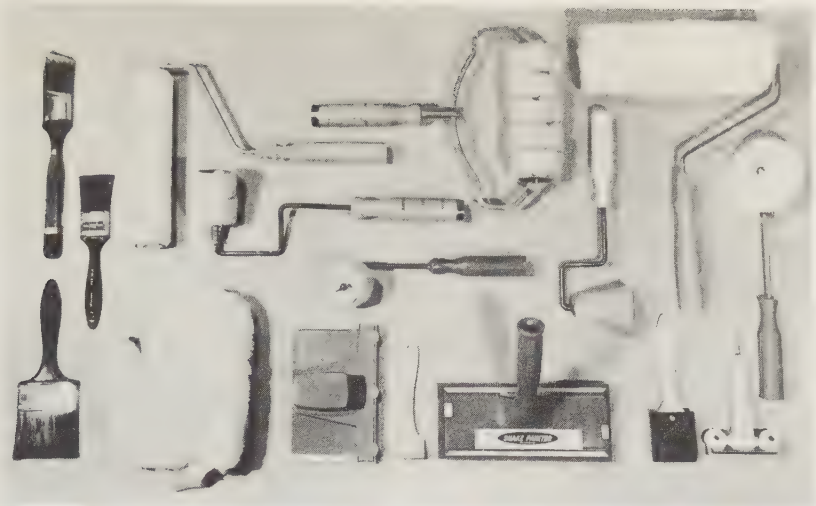
Remember to subtract from wall areas windows and doors that are to be done in a different color. These are easy to measure from inside the house. For a simple gable or peak, measure from eave to eave, and then up to the peak. Divided by two, this will give you a fairly accurate idea of the area to be covered. If you have a gambrel roof, measure the peak area the same way, but add about 25% to allow for the extra space to be covered by the wall paint. For gothic, double-hip or barrel-shaped roofs, an addition of 50% is advisable.

In any case where you are in doubt, let your paint dealer give you the benefit of his experience. An established paint store is a mine of information and tips, and the man behind the counter can spare you many a headache. Since the majority of his customers are professional painters, the tips and hints he has learned over the years are valuable time- and trouble-savers.

When you plan to do a two-coat job, remember that the first coat will seal the surface and that the second coat will flow out over this foundation, and so take less paint. In figuring out how much you need, remember it is always better to have too much than too little, especially if you have a color mixed to order. An unopened can can usually be returned, but having a special color mixed to match an area already painted is difficult.

See also: PAINTING, HOUSE; PAINT SPRAYERS.

paint doors: see doors
paint floors: see floors



Paint with Brushes, Pads or Rollers

No matter what you want to paint, there is equipment designed to do the job. Use this guide to select the painting tools that meet your requirements

THE PROS AND CONS of hand painting tools are simple. The roller is four to five times as fast as the brush, and, unlike the brush, it produces professional looking results even in the hands of an unskilled user. But it is not as versatile as the brush. The roller that suits large flat areas like walls can't paint into corners, nor can it keep its speed advantage on surfaces like pipes and columns. So you need a brush, or special rollers for those jobs, and for cutting in around trim at windows and doors. But it still leads the field as a time saver.

The pad applicator, which slides instead of rolling, now often replaces the brush for the special purposes just mentioned. And many new pad applicators have features that eliminate still further the skill required by the brush on the same type of job. The wheel-edge roller, for example, with its wheels riding along the ceiling, lets you apply a different color to the wall without irregularity or spillover along the line of juncture. The corner roller, on the other hand, paints into vertical corners, applying a starting stripe of the same color on two adjoining walls in a single pass.

The brush requires more time and skill, but it is still the most versatile painting tool, and the best for certain types of work. It is, for example, the best choice for fine enamel and varnish work. The explanation lies in the basic mechanics of painting tools.

How the painting tools work. The roller splits the paint film, leaving half of it on the surface, pulling the other half up and off with the revolving roller covering. So it produces a stippled effect, even though often almost undetectable, depending on the roller. The brush, with its sliding motion, exerts a shearing action on the paint film. Instead of a stipple, the brush has a smoothing effect that might be compared to planing. Its smoothness, however, depends on the skill of the user, largely a

On smooth walls, as plaster or wallboard, start with an M or W figure, then fill in area.

Roll vertically or horizontally on rough walls, such as masonry or masonry block, because the surface absorbs excess paint.

Long handle that fits standard roller makes ceiling painting easier. Leave a gap along the beam and fill it with a wheeled pad painter.

Corner roller coats a strip on both walls where ordinary roller can't reach.

matter of "feel" acquired only by experience.

The bristles of a brush may be either natural (typically from hogs) or synthetic, as nylon or polyester. Natural bristles are set in the brush in the same relative position they occupied on the animal, with the large inner (skin) end inward, the smaller outer end outward.

The better synthetic bristles are set in the same way, and are also made with a taper. Typical taper of a three-inch-long high-grade nylon bristle: 9/1000-inch at the large end to 5/1000-inch at the small (outer) end. (Low priced brush bristles lack the taper.)

The tips of quality nylon brush bristles are also flagged—producing a split end

Use a wheeled pad painter at the wall-ceiling juncture, if the wall and ceiling are different colors, for a really neat job.

Pad painter can be used at room corners, first on one wall and then on the other.

Paneling can be stained with pad painter.

Plastic or metal grid in bottom of roller tray keeps roller from sliding instead of rolling when the roller is being loaded with paint. It also prevents overloading.

that holds and distributes paint better. (Natural bristles already have this feature.)

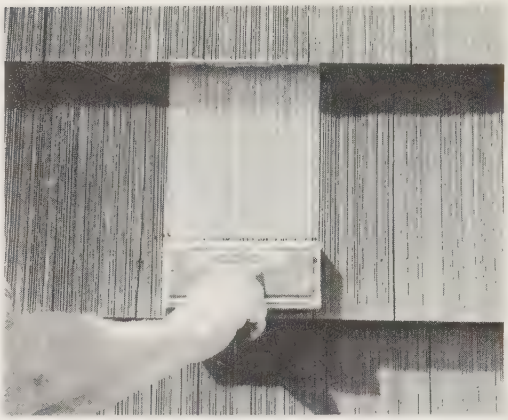
The China bristle used in many quality brushes is a hog bristle, named for its national origin. The Tientsin type from northern China is long and fine, as the animals grow a thicker coat in that colder area. These are suited to fine enameling and varnishing. The Hankow bristle from southern China is shorter and stiffer, suited to heavier paints.

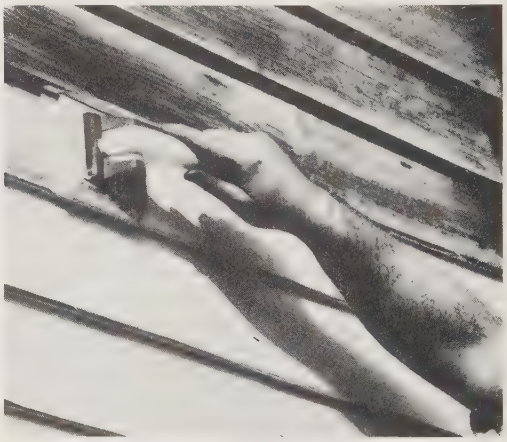
In general, both natural and nylon bristles work well in all conventional paints, though natural bristles tend to lose some of their resilience in water paints. Nylon bristles do the same in alcohol finishes like shellac. (Cure the nylon floppiness by turpentine immersion and thorough drying.)

A shake painter is a pad applicator for use on shingles.

Multi-roller unit with small rollers mounted on a flexible spring shaft is designed to paint round objects like columns, rain spouts, pipes, etc. Paint one side with one pass and the opposite side with a second pass.

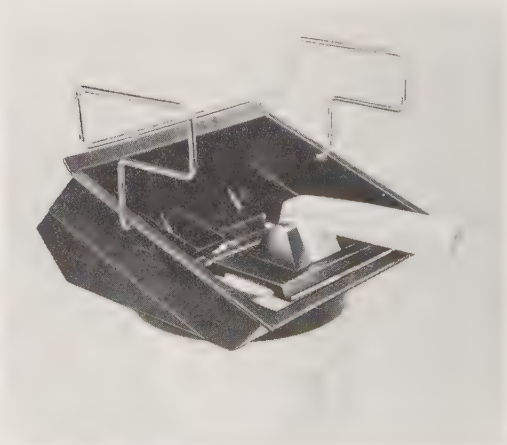
Use a long pipe roller to coat wire fencing.





Using a pad painter on siding.

A tip tray with paint reservoir makes pad painting easier.



If summer heat takes the spring out of nylon bristles during exterior painting with water paint (for which nylon is ideal), use an occasional ice-water dip to cure the trouble.

Brush shapes and sizes should be matched to the job—wide brushes for large, flat surfaces like walls and ceilings, narrow ones for narrow surfaces like moldings and trim. (Brushes fit into fluted molding forms better than rollers or pads.) As brushes actually become shorter with wear, a wide brush frequently drawn broadside along a narrow molding, so that only a central brush portion is used, may develop a center notch, forming what painters call a "fishtail." Drawn sideways along a narrow molding, its bristles tend to pack into numerous separately bent "fingers." Either way, the brush becomes unsuited to its original large area work. To avoid this problem, use narrow brushes for narrow work.

Sash brushes may be round, oval, or flat with angle-cut ends. The angle cut prevents the finger formation mentioned above. All

Cylinder roller (left) and cage roller (right) accept only one size of paint roller. Adjustable roller in center can accommodate a variety of roller sizes.

Wrong way. Using a wide brush on a narrow edge wears away the center area of the brush. The central notch that develops from uneven wear makes the brush useless for painting large areas. Always use the right brush.

Right way. Paint edge with a narrow brush that coats the edge in one or two passes.

three do the job effectively. The choice is a matter of personal preference, with professional painters often favoring round or oval, possibly for reasons of tradition.

Your best final guide in selecting a brush suited to the work: a comfortable "feel." If you like the way a particular type of brush handles when you use it, you'll do better with it.

Rollers are made to suit the type of surface on which they will be used, often classified by manufacturers as smooth (like plasterboard), semi-smooth (textured wallboard), rough (light stucco), and very rough (concrete block or brick.) The "nap length" or "pile height" of the roller covering varies accordingly. For smooth surfaces it's ¼-inch, for semi-smooth, ⅜-inch to ½-inch, for rough ¾-inch, and for extra rough, 1½ inches. A smooth grade roller used on a rough surface will leave unpainted gaps and spots. A rough grade roller used on a smooth surface will overload the surface with paint, producing sags and runs. Always buy to suit the job.

A freshly loaded roller contains more paint at the start, so begin smooth-surface work by rolling the form of a W, M, or similar zig-zag on the surface to be painted to lay the initial paint load. Then fill in the intervening spaces, typically over an area around 2 x 3 feet. On rough surfaces like masonry blocks, which absorb the initial paint load quickly, you can use simple vertical or horizontal roller strokes.

Watch the back and forth strokes of your roller and you'll notice the surface is smoother after a pass in one direction than in the other. The reason: the nap on the roller has a slight slant. Arrange your work so the final strokes are applied with the roller moving only in the direction of the smooth result. This might call for a vertical up-stroke, roller lift-off, then another vertical up-stroke. (Or horizontal strokes in one direction.) If you prefer down strokes, simply turn the roller handle over in your hand. Look for this smoother direction next time you use a roller. You'll get a better finish.

In all roller work make secondary roller passes over all areas at right angles to the initial passes in order to force paint into irregularities like nail head pits. This is simply a matter of the direction of roller movement, not of applying a second coat, unless second coating is required for adequate covering.

Roller construction is largely of three types. The old familiar is the rod and nut. Remove the nut, slide the roller off the shaft and fit a new roller between the end caps. The cage type has longitudinal spring strips between the roller end caps. The roller cover is simply slipped on or off the strips.

The cylinder type works in similar fashion, but is adjustable by manipulating the tabs that hold the cover. Choice is a matter of personal preference. Whatever type you use, ask for use instructions when you buy, and buy your rollers or covers to match.

Roller quality involves the type and density of the pile fibers. It is not merely a matter of durability. Higher quality pile produces a smoother, better covering job with less effort. As the best roller cover costs less than a quart of typical house paint, it is wise to use a quality grade. Don't allow paint to harden on the roller during the overall painting job. (Wash the roller thoroughly at the end of the day, or keep it immersed.) As you're not likely to repeat a major interior or exterior house painting job for several years you'll save time and trouble by simply discarding the used roller covers.

Pad applicators. Use the same procedure with these as with rollers. Small ones are easy to wash clean after use. Replaceable pads for large ones may be cleaned between stages of the job (as between painting days) and discarded after the job.

See also: PAINTING; PAINTING, HOUSE.

How to Prepare Surfaces for Painting

Here's what to do when the surface you want to repaint is rough, cracked, peeled or blistered

BEFORE YOU OPEN that new can of delightfully colored paint or sparkling varnish, make sure that the surface on which you intend to use it is spanking clean and free of loose flakes of paint from time past, and that cracks have been leveled and filled.

Any accumulation of oily polish or wax can be removed with turpentine or mineral spirits. Always do this part of the job with adequate ventilation, and refrain from smoking. If you prefer, a good household detergent may be used. Well-stocked paint stores have products specially formulated for this purpose. Some of the newer ones require no rinsing, thus cutting work time in half.

Wood surfaces. After being cleaned and allowed to dry thoroughly, wood can be lightly sanded to a smooth finish. If the wood has been previously painted, a good cleaning job may be all that is needed before repainting. However, if old paint or varnish is badly crazed or wrinkled, use a remover to get down to the bare wood. This may take some effort, but the professional result will make it most rewarding. Removers can be the rinse-away type, or for walls, where slippage is a problem, a waxy type that stays put until the paint is softened. Be sure to use the solvent advocated by the maker of the remover. Failure to remove any waxy residue will result in poor adhesion of new finish, whether paint, shellac or varnish.

When you encounter layers of old paint that are so stubborn it would take coat after coat of remover to lift them, a blowtorch can save the day. Follow with a broad-bladed putty knife to lift off the old paint in sheet form. Sometimes a final going-over with a rinse-away remover is advisable, although hardly necessary unless you are planning a drastic color change.

Metal. If you intend to refinish metal, a wire brush will remove most old rust and scaling paint. A follow-up with sandpaper will result in a clean slick surface with just enough "bite" for new paint.

Masonry. When you desire to paint masonry walls, most old-fashioned paints and whitewash brush off with little effort. Carbide scrapers made just for this purpose are also on the market. While you are about it, seal any leaks or cracks with grout.

If the masonry surface is a greasy one, such as a garage floor, scrubbing and rinsing are necessary. A coating of sawdust to soak up excess oil drippings will cut your

working time a lot. After the sawdust has absorbed most of the oil (you can tell by the dark tone as the wood soaks up the oil), sweep it up and proceed with the wash-down.

Be sure that the floor is dry before you paint, unless the paint you use is formulated for application on damp surfaces, as are some of the new latexes and acrylics. Read the label carefully about this point, otherwise your work may be in vain.

A rental floor-scrubber is useful when you need to clean a large area. With its hefty bristles and a strong detergent, you can have an immaculate surface with a minimum of effort.

See also: ABRASIVES; FINISHING, WOOD; FLOORS; PAINT; PAINTING, HOUSE; SOLVENTS AND STRIPPERS.

A replaceable-blade scraper can speed the work of removing old paint.

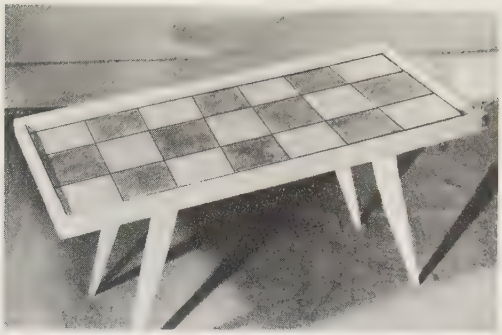
Save time when sanding by putting the abrasive in a holder.

For a tough paint removal job, use a torch to soften paint and a knife to scrape it away.

If you have a lot of molding to scrape, you can make a scraper out of sheet metal that conforms to the shape of the molding.

Paint Wood or Fabric with Dyes

Widely available inexpensive dyes can be used to create interesting effects on table tops, drapes, or wherever your imagination leads you



The completed table glows with vivid color. Various colored dyes were used for checkered effect. Color choice is up to you.

When painting with dye on fabric, embroidery hoop is a great help to keep material taut.

GAY AND BRILLIANT effects can be achieved by using aniline dyes. The tile pattern used on the plywood-topped table in the accompanying photo is easy to follow.

Mark the squares in pencil, then lightly groove them. Make a simple guard of cardboard to fit in the grooves so that color does not flow from one square to the other. Mix small containers of all the colors you intend to use, according to the directions on the containers. Using the cardboard guard, apply the colors with a brush just as you would paint.

After all the dye is dry, a light hand sanding will eliminate any raised grain due to the water mixed with the dye. Apply a first coat of any natural wood finish, sealing the pores of the wood. Then carefully work spackle into grooves. The reason for applying a seal coat before spackling: it lets you wipe off any spackle smears before the final finish is put on. The grain of the wood will show through the dye color in a most pleasing manner. A glossy finish over all makes the colors glow. To set off the top, add a rim in low gloss black. Legs, also, are black.

Dye-painting on fabric. When you want to create a special effect on fabric, all you need is a design to trace and dye. Embroidery hoops in proper size for your design will hold the fabric smooth and taut for easy work. Embroidery transfers can also be used as patterns and come in a wide range of designs.

For all dye-painting, use a concentrated solution, and whether you are working on wood or fabric, try your mixture on a scrap before sailing into the project. Keep bowls or jars of fresh water handy for cleaning brushes when you are short of individual brushes for each color. A quick dunk in one, and a rinse in the second, and one brush can do the work of many. If you desire to use your painted fabrics for more than occasional festivities, see the instructions on the package for information about how to set the colors so that they may be washed in warm (not hot) soapy water.

See also: CRAFT PROJECTS; DECORATIONS; FINISHING, WOOD; FURNITURE, USED; INLAY WOODWORKING; STAINING.

➤ *The top of this Victorian table looks like marble. Actually, it is plywood treated with a marbleizing kit.*

Make a Marble Table Top Out of Plywood

You can marbleize plywood, or any other smooth paintable surface, with a special kit or with fast drying enamels

A MARBLE-TOP TABLE with a smashed or missing top is relatively common junkshop item. The Victorian table shown in the accompanying photograph is an example that sold for $2 because it lacked the original marble top that would have raised its price to about $35. To have a new marble top cut to fit would have cost even more. But in less than a half hour's actual working time (not including time out for paint drying), a simulated marble top was made from plywood.

There are two popular methods of sim-

ulating marble with paint, the simplest of which was used on the oval top made for this table. The materials used came from a marbleizing kit that includes the paints required and a special type of spray unit that fits most tank-type vacuum cleaners.

The background color—in this case, white—goes on first. It can be rolled, brushed or sprayed on. After it dries thoroughly (overnight is best), it's ready for the black marble veining. One coat of the background color is usually enough if it is applied over a similar color. If the wood or the original color is dark, two coats may be needed.

The marble veining must be applied with the special vacuum cleaner spray attachment. (Don't try to use your regular vacuum cleaner spray gun.) Thin the veining liquid only according to the instructions on the container. Then try it out by spraying on a scrap piece of wood or cardboard. It's hard to believe what you see. The veining or marbleizing liquid does not come out of the nozzle as a spray, but as an intermittent stream of flying threads. When they strike the background-coated surface, they bond to it in wavy lines that resemble marble veining exactly.

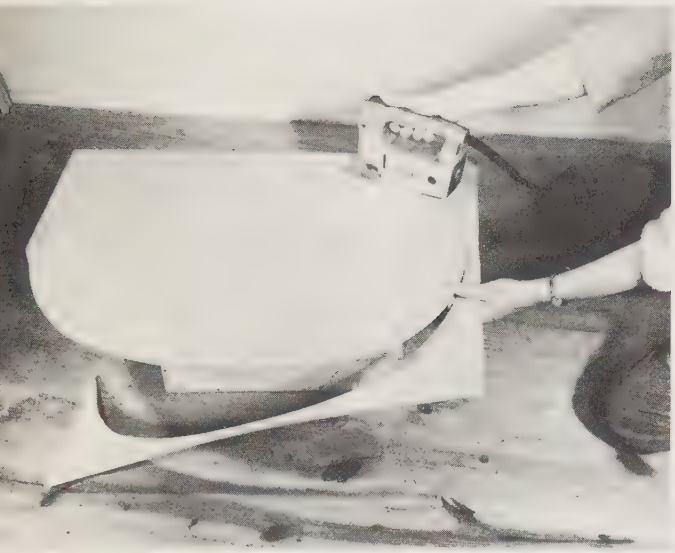
The spray unit must be kept moving constantly so the veining won't pile up in one area. The faster the spray unit is moved, the more open the veining pattern. If you want more dense veining, move the gun slowly. A few practice shots on scrap surfaces will show you how to get whatever effect you want. No artistic skill is involved as the flying threads of veining material take on a naturally wavy form and automatically create the pattern.

To waterproof the finished marbleizing job so spilled beverages and wet glasses won't stain it or leave rings, simply apply a coat of liquid vinyl laminate.

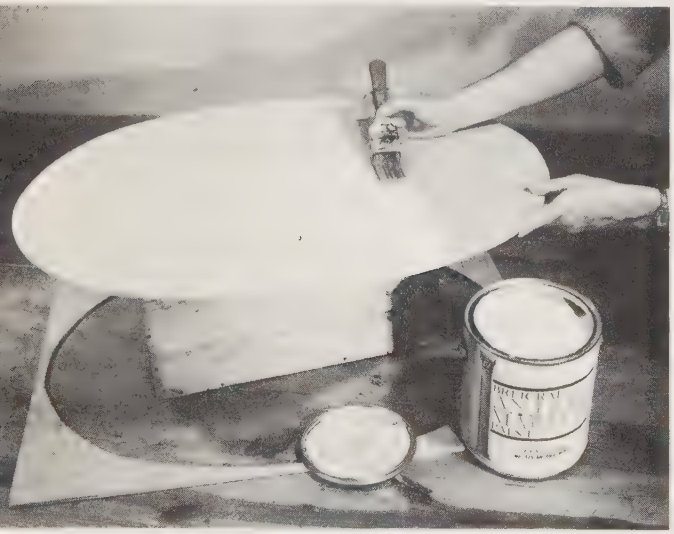
The enamel method requires a trifle more skill plus two or more fast-drying enamels. Apply the background enamel color. Then, while the background is still wet, apply the contrasting color or colors in wavy lines with an artist's brush. A wad of crumpled

Table was purchased in a junk shop for only $2 because marble top was missing.

Trace the outline of the table on a piece of $^3/_4$-inch plywood. Use a small block of wood as a spacer between the table edge and the pencil to create a slight overhang.



Cut the top to desired shape with a saber or compass saw; sand the edge smooth.



Use brush or roller to paint on the base coat of the marbleizing kit and allow it to dry. Two coats may be necessary.

Use a white piece of smooth cardboard to practice spraying the veining coat of the marbleizing kit. The veining coat requires a special sprayer that comes with the kit and fits on a vacuum cleaner hose. After practicing, spray the table top.

newspaper may also be used to blend and soften the edges of the lines. Here again, it's a good idea to try the system on scrap wood or smooth cardboard first. Tipping the surface to cause slight running of the streaks adds to the realism of the veining.

Don't try this system with random leftover paints unless you are sure they're compatible types. If not, they may lump or jell where they blend, possibly remaining sticky.

Any number of colors may be used to simulate various marble tops, as long as the enamels are of a matched type. When either the spray or enamel method is used on plywood where the edges will be exposed, as on the Victorian tabletop, there's a quick and easy method of sealing the edges. Simply spread cellulose household cement along the edge with finger tip or spatula, covering the entire edge. This dries fast, sealing the end grain. G.D.

See also: ANTIQUING; FINISHING, WOOD; FURNITURE, USED; LUMBER.

Paint Your Car Like a Pro

Rent the tools, buy the paint and make your car look like new again—at a substantial saving

It is essential to carefully mask with tape all chrome parts not to be removed.

IF YOU CAN AFFORD to buy a brand-new car every year or two, this article is not for you. But if, like most people, you have to squeeze three, four, or more years out of every car you own, there is one quick way to at least make your car look new: repaint it.

Don't get us wrong; the job is not a snap. Figure on at least four or five full days. On the other hand, you don't need any special skills or experience. With today's modern paints and sealers, even an amateur can do a professional job.

You don't even need to buy expensive tools. Nearly every town has a shop that will rent you an air compressor, spray gun, and (if you don't already have one) an electric drill. Add a few basic hand tools that you probably already own, plus about $50 worth of materials, and you're ready to start.

You say you can get a professional paint job for the same money? Don't you believe it. High-quality car refinishing can cost $250 or more. The fast-buck operators who offer "cheapie" deals have to cut corners to make a profit. Most do very little sanding of your old finish—a vital step if the new paint is to stick. Instead of removing trim, they usually mask it off; this gives a sloppier job, and may promote corrosion. They won't do any body repairs unless you pay extra. They apply few coats of paint, and the materials they use often are inferior. With a little care and patience you can do much better.

One important point: a fully enclosed garage (with heat, if the weather is cold) is a must. Never, never try to paint a car outdoors.

You'll need plenty of newspapers for masking, plus clean, lint-free rags for wiping body surfaces. Start saving these a couple of weeks before you start working. Buy your materials from a body-supply store, not an ordinary hardware store; that's the only way to be sure you're getting materials designed for auto bodies rather than furniture or the back-yard fence.

Preliminaries. Your first job is to remove the bumpers, grille, outside mirrors, door and trunk handles, bright metal headlight rims, side trim, emblems, and all other brightwork. Some trim, especially on older cars, may be hard to remove because of corroded nuts and bolts. Apply penetrating

painting, boat: see maintenance, boat
painting furniture: see furniture, used

oil to problem areas. As a last resort, use a hammer and chisel and then replace the nuts and bolts. As you remove small hardware, drop it in labeled envelopes for easier identification during reassembly.

Now check the stripped body for dents, gouges, holes and rust, and make all necessary repairs; blemishes will show up prominently under shiny new paint. In case of major damages, let a body shop make the repairs. Tell the proprietor you want the area primed but not painted; that should cut the price.

You can fix small dents and holes easily with the inexpensive do-it-yourself patch kits sold in auto accessory stores. (These kits come with instructions.) Caution: Be sure you buy an epoxy resin kit intended for cars; some patch kits intended for fiberglass boats give poor results on metal.

Grind away rust spots with a rotary grinder or electric drill equipped with a sanding disk until you're down to shiny bright metal. If the rust goes all the way through, cut away the cancerous area and patch with fiberglass. For larger holes, have new metal welded in. Incidentally, don't go overboard with the grinder; those rotary grinding scratches are hard to sand smooth.

Application of putty to fill in dents can be done by using a kit which is available in most auto accessory stores.

Now for an important decision: Is your old finish sound enough to form a base for the new paint? In most cases it is. But if your old paint is chipping and peeling, don't expect new paint to adhere any better. Your only sensible solution then is to remove all the old paint, right down to bare metal.

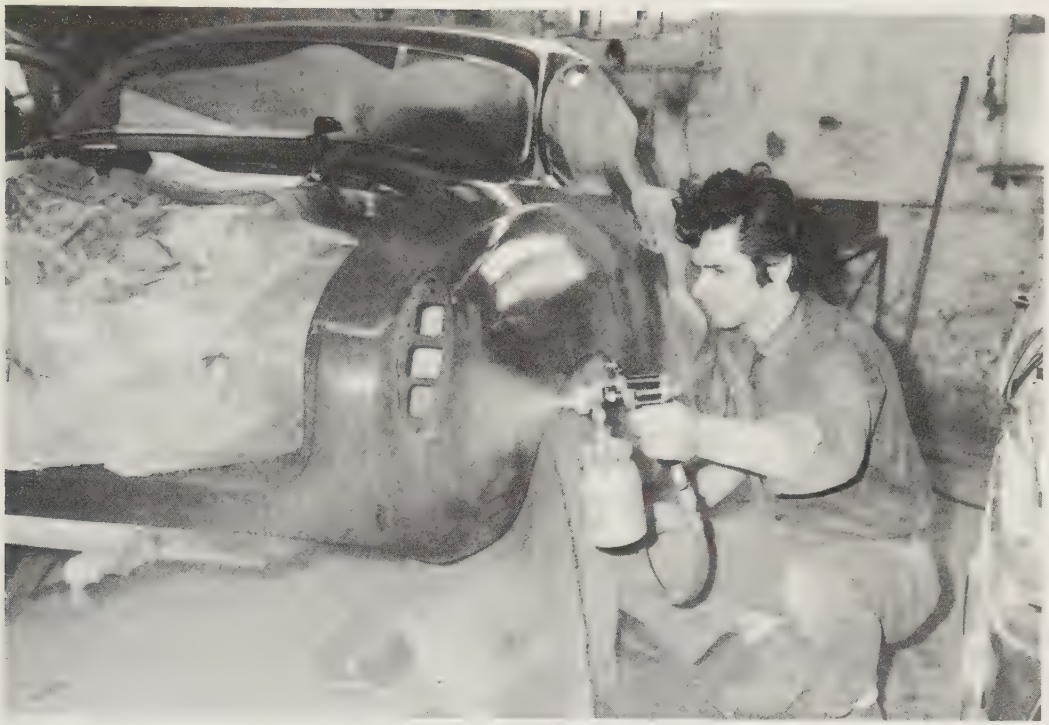
This isn't as hard as it sounds. You can buy a chemical paint remover that will quickly loosen the old paint. Operating procedures vary from brand to brand, so follow the instructions on the container. After the paint is removed, flush thoroughly with water and wipe dry. To prevent surface rust, which forms very quickly, apply etching solution panel by panel.

If the old paint is satisfactory, clean it thoroughly with degreaser-solvent, rubbing in the liquid with clean rags to remove old wax and grime. From that point on, don't touch the metal with your bare hands; the oil in your skin could impair adhesion of the new paint. If you should accidentally touch the metal at any time right up to the final spraying degrease the area immediately.

Sanding. Now sand the entire car to remove the oxidized top surface and to give the new finish a good grip. The way you sand the body will make the difference between a smooth, long-lasting job and one that starts peeling in days or weeks.

A rigid sanding block has too small a contact area on curved body panels, and hand-held sandpaper gives high and low spots because of uneven finger pressure. Instead, use a rubber sanding block; it will conform to the surface while distributing pressure evenly.

Use waterproof auto body sandpaper, and dip it in a pail of clean water frequently. The water clears residue from the sandpaper and acts as a lubricant. Start with the coarsest (220-grit) sandpaper, taking



Spray paint in as dust-free an area as possible.

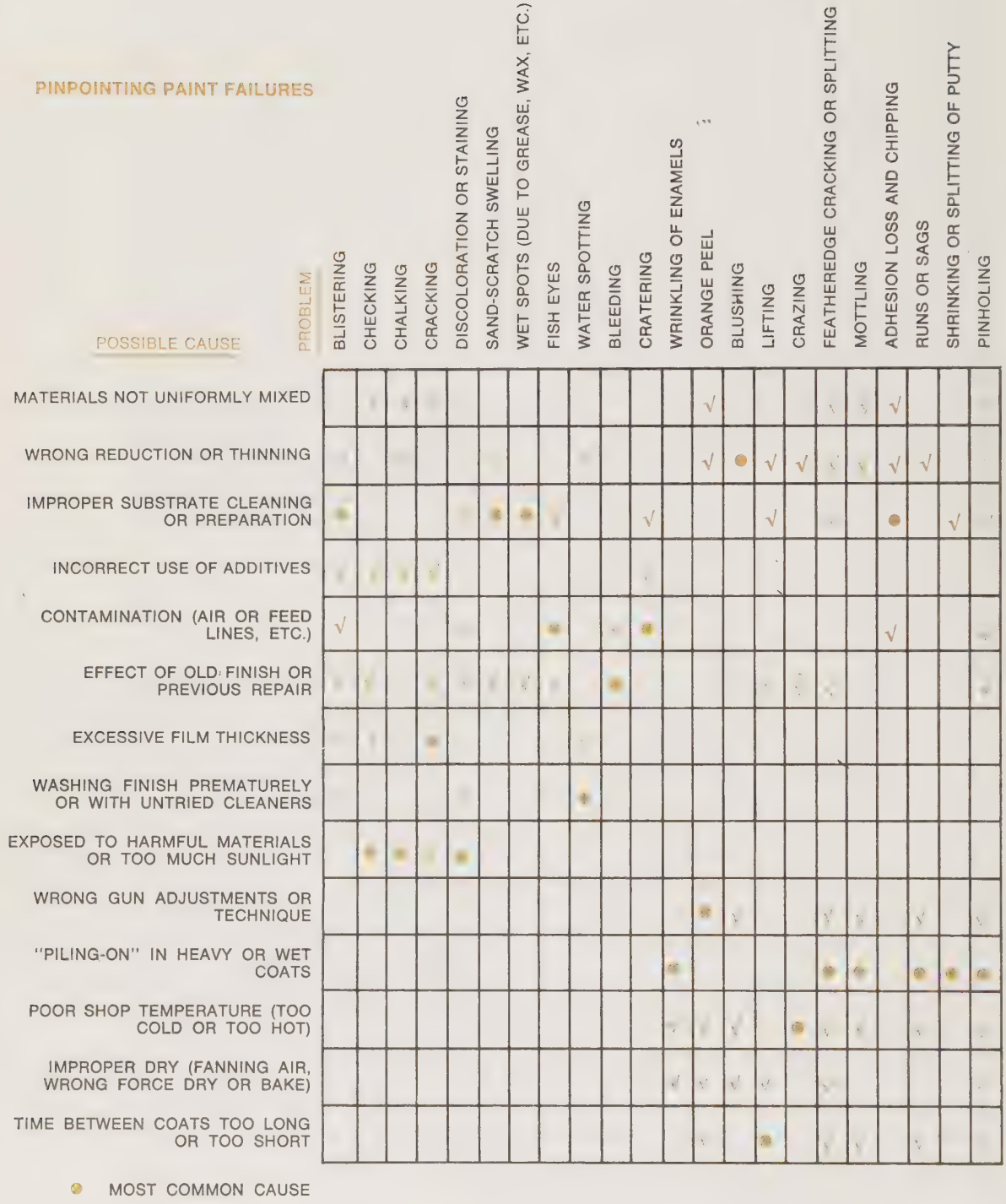
special care to remove all traces of rotary grinding and to featheredge chips and scratches. Sand back and forth in a front-to-rear direction. Never cross-sand.

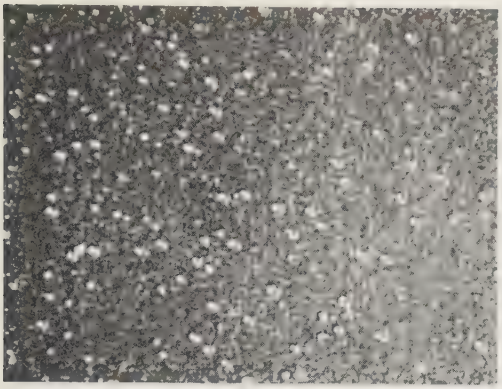
After sanding every inch of the body, repeat the wet-sanding operation with the next-finer #320, and then with #400 sandpaper. Then wash away all sanding dust with plain water and a clean rag, dry the surface, and let the car stand for several hours, preferably overnight. Leave the garage doors or windows cracked open for ventilation.

Before resuming work, pull the car out of the garage, wet down the garage floor with a hose, and sweep out the dirt. Then drive the car back inside and mask off any areas not to be painted—windows, wheels, headlights, etc. The easy way to do this is to apply masking tape to the edge of the paper first, and then to the car. Go over the entire car with a tack cloth—a special, slightly sticky rag—to remove dust. Now you're ready to spray on the primer-surfacer, or undercoat.

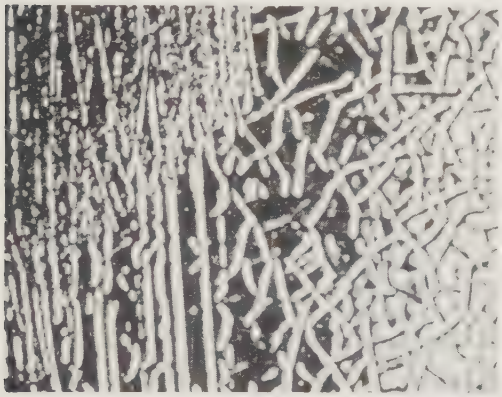
Spraying. When you select the spray gun and compressor (large paint stores as well as body supply shops rent them), be sure you get the right ones. Two main types are available: the preferred siphon-feed type, in which air pressure passes over the opening in the fluid nozzle and creates a suction that draws the material from the cup, and the pressure type, in which the material is pushed out of the cup by air pressure. (This kind clogs easier.) A third type of gun, known as the airless spray type, subjects the paint to tremendously high pressure by means of a self-contained pump. This type of gun makes it difficult to control film thickness, and causes runs and sags on contoured surfaces. Stay away from it.

PINPOINTING PAINT FAILURES





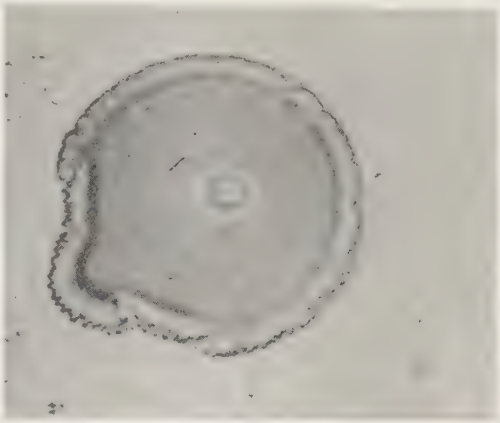
▲ *BLISTERING: Sand affected areas to a smooth finish or, in extreme cases, remove finish down to the metal and refinish.*



▲ *CHECKING: If proper gloss and smoothness cannot be restored by slight rubbing or polishing, sand the affected area to a smooth finish and refinish. In extreme cases, affected area may have to be removed to the primer.*

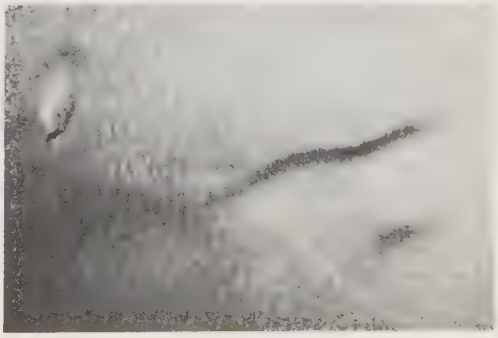
▲ *CHALKING: When this condition is encountered, rub and polish the surface to remove "dead" pigments and scale.*

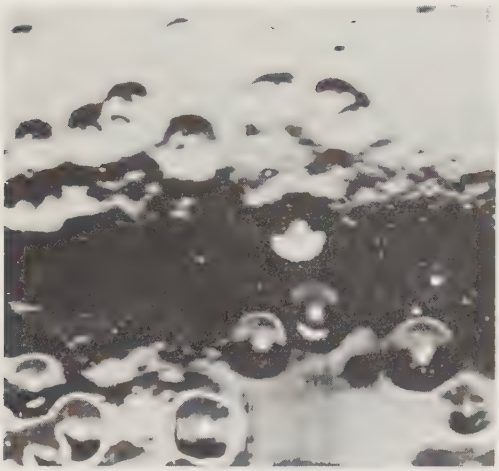
▼ *DISCOLORATION OR STAINING: Rub with rubbing compound and polish or, in severe cases, sand to primer and refinish.*



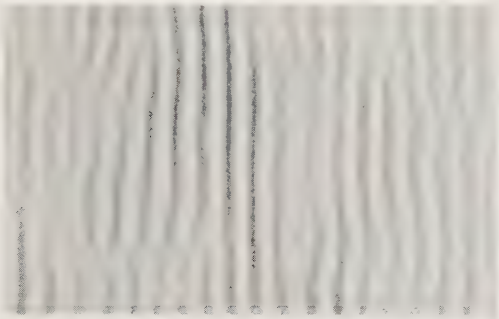
▼ *WET SPOTS (due to wax, grease, etc.): Remove finish from affected area and refinish.*

▼ *WATER SPOTTING: Rub with rubbing compound and polish or, in severe cases, sand affected areas and refinish.*

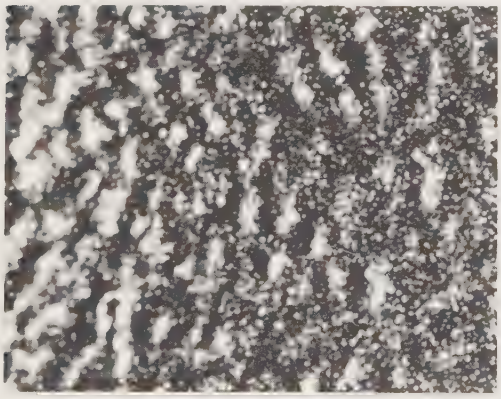




▲ *CRATERING: Sand affected areas to a smooth finish and refinish.*

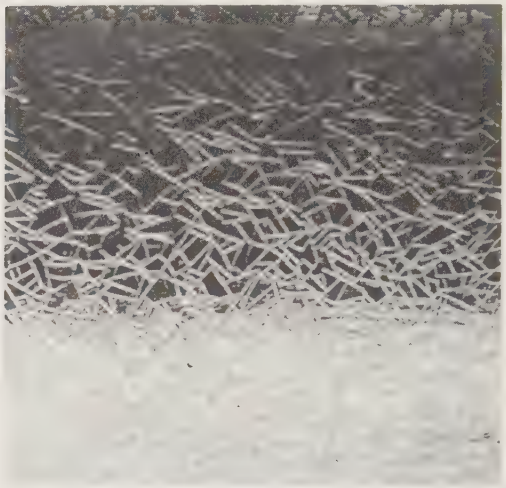


▲ *WRINKLING OF ENAMEL: Remove wrinkled enamel and refinish.*

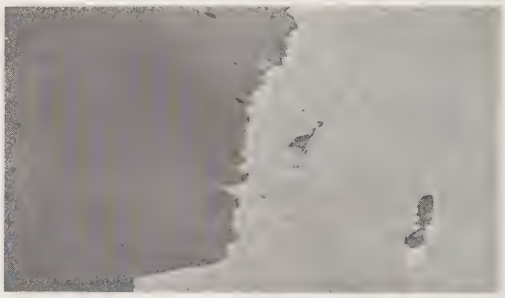


▲ *ORANGE PEEL: Rub with rubbing compound when thoroughly dry, or in extreme cases sand down to smooth surface and refinish, using a slower evaporating thinner or reducer at a lower air pressure.*

▼ *CRAZING: Over reduce with thinner blended with retarder and apply wet double coats until crazing pattern disappears.*

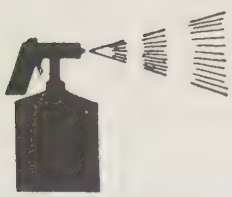


▼ *ADHESION LOSS AND CHIPPING: Remove the finish for an area considerably larger than the affected area and refinish.*



▼ *SHRINKING OR SPLITTING OF PUTTY: Remove putty in affected areas and reapply using thin coats.*

CAUSES OF IMPROPER SPRAY GUN OPERATION



SPITTING

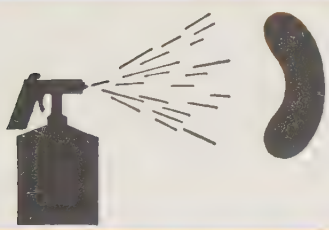
A. Vent hole in cover may be clogged.

B. Fluid nozzle worn or cracked. Dirt between fluid nozzle seat and body.

C. Loose or defective swivel nut on siphon cup or material hose.

D. Loose fluid tube.

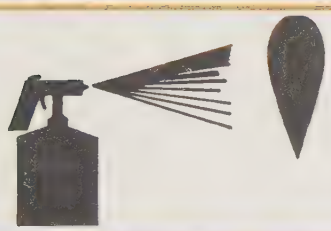
E. Worn or imperfect needle.



CURVED SPRAY PATTERN

A. One air nozzle hole clogged.

B. Air nozzle worn.

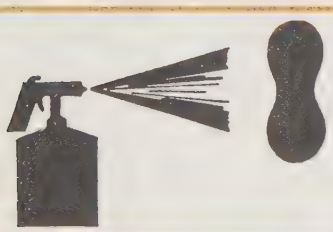


OUT OF BALANCE SPRAY

A. Dried material in or on fluid nozzle.

B. Jets in air nozzle may be partially plugged.

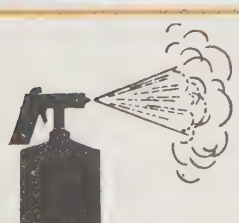
C. Worn or imperfect nozzle or needle.



SPLIT SPRAY

A. (Split spray refers to a fan pattern that is heavy on each end and weak in the center.) Air pressure too great.

B. Material too thin for wide spray pattern.



EXCESS OVERSPRAY

A. Excessive air pressure in proportion to weight of material.

B. Material too thin.

C. Gun not close enough to the surface being refinished.

DRY DULL FINISH

A. Insufficient compressor capacity.

B. Pressure drop due to line friction obstruction or leaks caused by badly worn hose.

C. Vent hole in cover clogged.

D. Air control valve partially closed.

The compressor should put out at least 40 pounds per square inch. And don't forget an inexpensive, disposable face mask to protect your lungs from the paint fumes.

Mix one part primer-sealer with one and a half parts thinner (or follow the manufacturer's instructions, if they differ), making sure the materials are compatible with the type of paint you will be using. (Lacquers are easier to use because they dry quickly.) Set the spray gun to form a fan-shaped pattern about nine inches wide, two or three inches high, and practice on some scrap cardboard.

Hold the gun from six to ten inches away and always keep it perpendicular and equidistant to the work. Never spray with the gun stationary; start the sideward motion before squeezing the trigger, and release the trigger just before finishing the stroke. The material should be wet when it hits the surface, but not so wet that it sags and runs.

Once you learn the proper motion, start spraying the car in long, horizontal strokes, overlapping considerably to avoid blotches and streaks. Then relax for 30 or 40 minutes while the primer-sealer dries.

Next examine the body for low spots, scratches, or other imperfections. You have to look closely to spot these when they're covered with dull primer; but if you miss any, they will be very obvious under the paint. Some pros prefer to spray a very thin, different-colored coat of primer over the first, and then wet-sand the body with #320 sandpaper. As they sand through the high spots, the low spots immediately show up.

Fill low spots or scratches with body glaze, applied with a rubber squeegee. If you must fill a deep area, use two or more thin coats of glaze rather than one thick one. Even better, hammer out the indentation first.

Allow several hours for the glaze to harden all the way through. (Hardening time varies with temperature and the thickness of the filler coat.) Then, using a *wood* sanding block long enough to bridge the patched area, dry-sand the glaze until it is perfectly flush with the primed surface. Start with coarse #180 sandpaper and work your way down to a #400 sheet. Wipe the area with a clean cloth, then a tack cloth, and reprime. Most primer-sealers do not require sanding however, with some a light spot scuff is permitted to remove dirt nibs. Follow the manufacturer's instructions.

Clean the spray gun thoroughly with thinner before switching to the paint. Refer to the paint label for the proper proportion of paint thinner to be added, making sure the right kind of thinner is used. Stir the thinned paint thoroughly, working the pigment from the bottom up. A coat hanger wire bent into a hook and chucked in an electric drill makes stirring fast and easy. Then pour the paint through a special strainer to filter out lumps that might clog the gun.

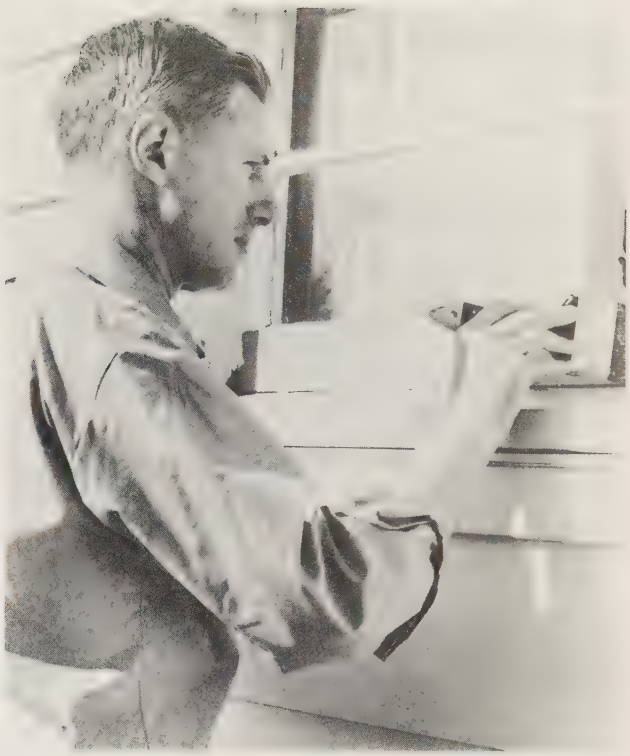
Wipe the entire car lightly with a tack cloth and start spraying on the color coats. Keep working around the car in a set pattern without stopping between coats. By the time you're ready to start the next coat, the previous one will have dried. After applying five coats, wet-sand lightly with #600 sandpaper and dry with clean rags. Let the paint dry overnight, go over the car with a tack cloth, and spray on four or five mist coats, using 50 percent more thinner than before. This gives a deep, shiny finish.

Wait another day before compounding the finish and remounting the chrome trim. A wax job should be postponed for at least two months; this will give the solvents in the paint a chance to evaporate, giving you a hard, durable finish that looks like a professional job, yet costs much less. P.W.

See also: ABRASIVES; PAINT SPRAYERS; REPAIRS, AUTOMOBILE.

Painting Problems and How to Solve Them

Use these tips to overcome the most common difficulties encountered in house painting

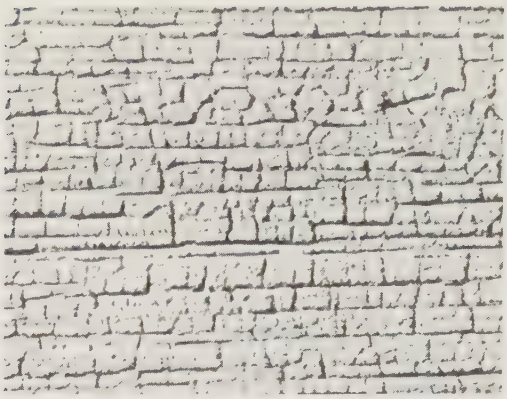


TROUBLE-SHOOTING PAINTING PROBLEMS

Condition	Possible Cause	Remedy
FLAKING/CHALKING MASONRY	Inadequate surface preparation. Paint flakes off in "scales" or powders and chalks off.	Remove flaking and chalking paint by wire brushing or sandblasting. Seal all surface cracks from moisture with a suitable masonry patching compound. Apply masonry primer according to label directions. Apply two top coats of latex house paint or exterior masonry paint according to label directions.
CRACKING AND ALLIGATORING	Previous paint film applied in several heavy coats without sufficient drying time between coats—or—use of undercoater not formulated for finish coat.	Sand cracked or alligatored surface smooth. Apply one coat of exterior undercoater and one top coat of recommended house paint according to label directions.
MILDEW	Mildew is a fungus that thrives on high humidity and high temperature. If left on the surface and painted over, it will grow through the new coat of paint.	Scrub entire surface with a solution of (⅓ cup) trisodium phosphate (TSP), eight tablespoons (½ cup) household bleach, in four quarts of warm water. Apply one coat of mildew-resisting primer. Note: Mildew-resistant additive may be added to an undercoat if mildew conditions are severe and an oil based top coat is used. The additive in a finish coat should be avoided. Apply one top coat of mildew and fume-resistant white or latex house paint.
TOP COAT PEELING	Usually found on overhanging horizontal surfaces and other areas protected from weather. It is caused by poor adhesion of previous coat of paint from build up of "salt" deposits which are not washed away by rain.	Sand surface thoroughly to remove all peeling paint. Wash sanded surface with solution of three heaping tablespoons (⅓ cup) tri-sodium phosphate to one gallon of water. Rinse well and allow to dry. Apply two coats of exterior undercoater or one coat of undercoater and one top coat of house paint according to label directions.

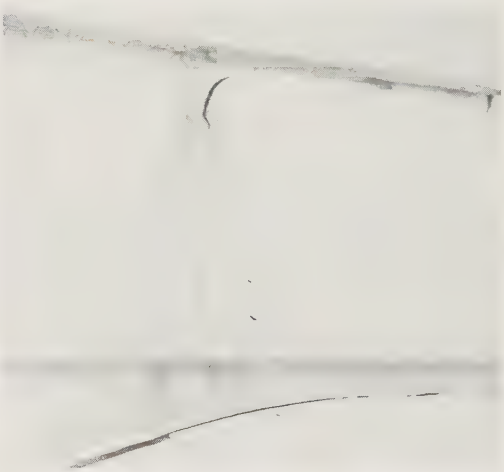
paint removal: see solvents and strippers

Flaking/chalking-masonry

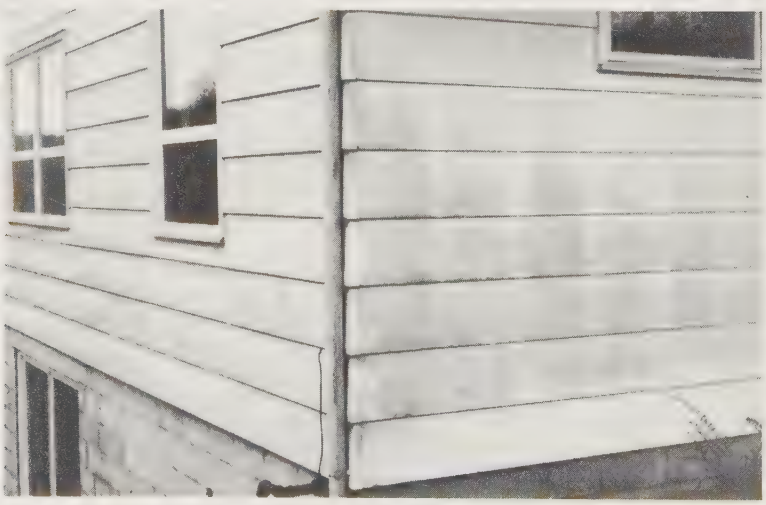


Cracking and alligatoring

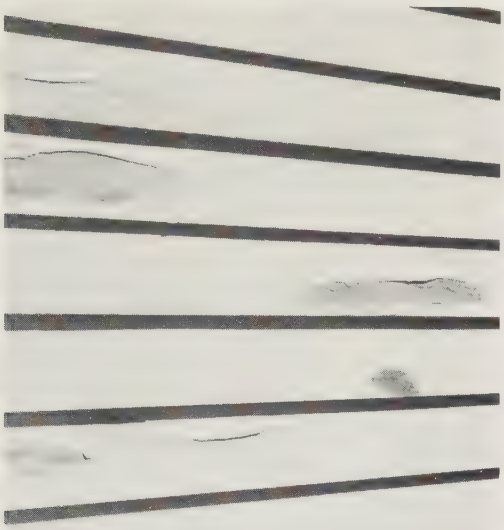
Top coat peeling



Redwood and cedar staining



Mildew



▲ *Blistering*

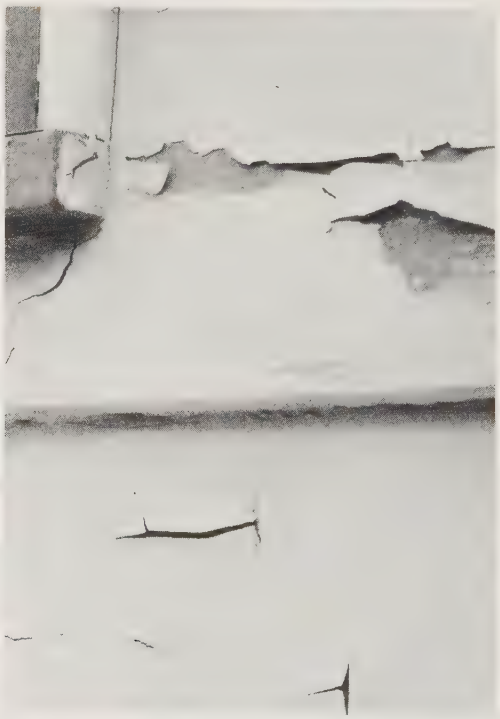
▲ *Peeling gutters*

Condition	Possible Cause	Remedy
REDWOOD AND CEDAR STAINING	Moisture in siding dissolves coloring matter in wood. Colored water escapes through breaks in paint films and drips from underneath overlapping board. Stain is deposited as water dries.	Locate and eliminate sources of moisture before painting. Wash stained surface with mixture of 50% denatured alcohol and 50% clean water. Allow surface to dry 48 hours. Then apply two coats of house paint according to label directions.
BLISTERING	Moisture trapped in siding is drawn from wood by sun's heat and pushes paint from surface.	Locate and eliminate sources of moisture. Is area near bathroom or kitchen? Is there seepage or leakage from eaves, roofs or plumbing? Scrape off old paint on board showing blistering and exposed wood—or scrape off old paint around blistered area approximately 12 inches away from blister condition. Sand surface to fresh wood and spot prime with recommended exterior undercoater. Seal all seams, holes, cracks against moisture entry with caulking compound. Apply top coat of house paint according to label directions.
PEELING GUTTERS	Peeling or cracking of galvanized metal gutters, downspouts, etc. Improper metal primer or no primer used on galvanized metal results in paint film with little or no adhesion.	Strip off all loose paint by scraper, wire brush, or, best of all, power wire brushing. It is very important that all loose paint be removed or succeeding coats of paint will subsequently peel away, too. When finishing with oil base top coat, prime bare spots with galvanized metal primer. When finishing with latex top coat, apply latex paint directly to bare galvanized areas after cleaning with a solvent such as mineral spirits. Allow solvent to evaporate. Finish with a top coat of latex or oil base house paint. Use two top coats when a color change is involved or substantial bare metal is exposed.

Condition	Possible Cause	Remedy
CHECKING	Plywood veneer cracked from expansion and contraction as it weathers and ages.	Sand surface smooth. If the cracked area is not extensive, spot prime the exposed bare wood and cracks with exterior undercoater. Fill primed cracks with caulking compounds. Apply top coat of house paint. Note: Should this problem be extensive, the best procedure is to replace the plywood. To prevent this problem on new plywood: Sand surface smooth. Apply one coat of latex wood primer and two coats of oil base house paint or latex house paint according to label directions. Note: When using latex house paint, if a discoloration shows in the latex primer a coat of exterior primer must be applied before applying the top coats.
LOCALIZED PEELING	Moisture trapped in siding is drawn from wood by sun's heat and pushes paint from surface.	Locate and eliminate sources of moisture. Is area near bathroom or kitchen? Is there seepage or leakage from eaves, roofs, or plumbing? Scrape off old paint on board showing peeling and expose wood—or scrape off old paint around peeling area approximately 12 inches away from peeling condition. Sand surface to fresh wood and spot prime with recommended exterior undercoater. Seal all seams, holes and cracks against moisture entry with caulking compound. Apply top coat of house paint according to label directions.

Checking

Localized peeling



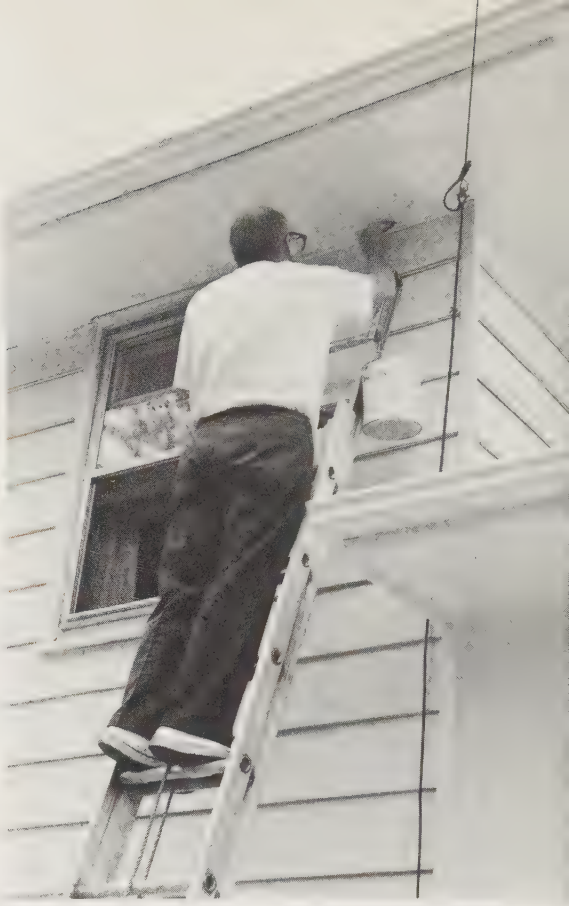
Painting Problems and How to Solve Them 1831

▲ *Flaking*

▲ *Nailhead staining*

Condition	Possible Cause	Remedy
FLAKING	Siding alternately swells and shrinks as moisture from behind siding is absorbed and then dries out. Brittle paint film cracks under strain and pulls away from wood.	Locate and eliminate sources of moisture. Is area near bathroom or kitchen? Is there seepage or leakage from eaves, roofs, or plumbing? Scrape off old paint on board showing flaking and expose wood—or scrape off old paint around flaking area approximately 12 inches from flaking condition. Sand surface to fresh wood and spot prime with recommended exterior undercoater. Seal all seams, holes and cracks against moisture entry with caulking compound. Apply top coat of house paint according to label directions.
NAILHEAD STAINING	Excessive moisture contributes to rusting of uncoated steel nails used in construction.	Locate and eliminate sources of moisture. Is area near bathroom or kitchen? Is there seepage or leakage from eaves, roofs, or plumbing? Sand or wire brush stained paint and remove rust down to bright metal of nailhead. Countersink nailhead ⅛-inch below surface of siding. Immediately spot prime countersunk nailhead with recommended exterior undercoater. Fill primed, countersunk holes with caulking compound. Apply two top coats of house paint according to label directions.

All about Exterior House Painting



Painting your house yourself is a major project, but it can yield substantial savings. Here's what you need to know to plan the job, buy the materials and apply the paint

THE EXTERIOR OF ANY HOME, whether it be clapboard, shingle, board and batten, brick, masonry or cement block, needs a proper finish to preserve its inherent beauty. When the time comes to redo, observing a few simple rules will save many a headache.

On clapboard, make sure that all loose boards are firmly refastened. When you find a loose nail, replace it with a galvanized or stainless steel one in the next size larger to be sure of a tight fit with its neighbor. Don't attempt to drive it in all the way with a hammer; use a nail set for the final blow. It is much easier to fill a nail-head recess than a full hammer-head hollow. A spot of sealer, followed by filter or putty, spot-primed, will be covered when you paint.

Prepare the surface. Flaking, scaling old paint should be wire-brushed and feathered out for a smooth surface. Blisters, often caused by a previous coating having been applied over a damp surface, should be broken, sanded and allowed to dry out before refinishing. A putty knife is good for this, as it lifts any loose paint surrounding the blister.

Dried putty around windows should be removed and replaced before repainting. Painting over loose putty merely compounds the crime; it will crumble worse than ever, and make all your effort in vain. Trim that is sparkling clean and really *trim* accents the fenestration, so much a part of the design of houses.

Windows. If window sash is in good condition it is only necessary to make certain that the surface is clean and that any loose or blistered paint has been removed before starting the repaint job. Windows are particularly prone to moisture problems because of the large glass area that acts as a condenser in cold weather, bringing a flow of water down over the bottom of the frame whenever the condensation reaches the extreme. The melting of ice on storm sash does much the same thing.

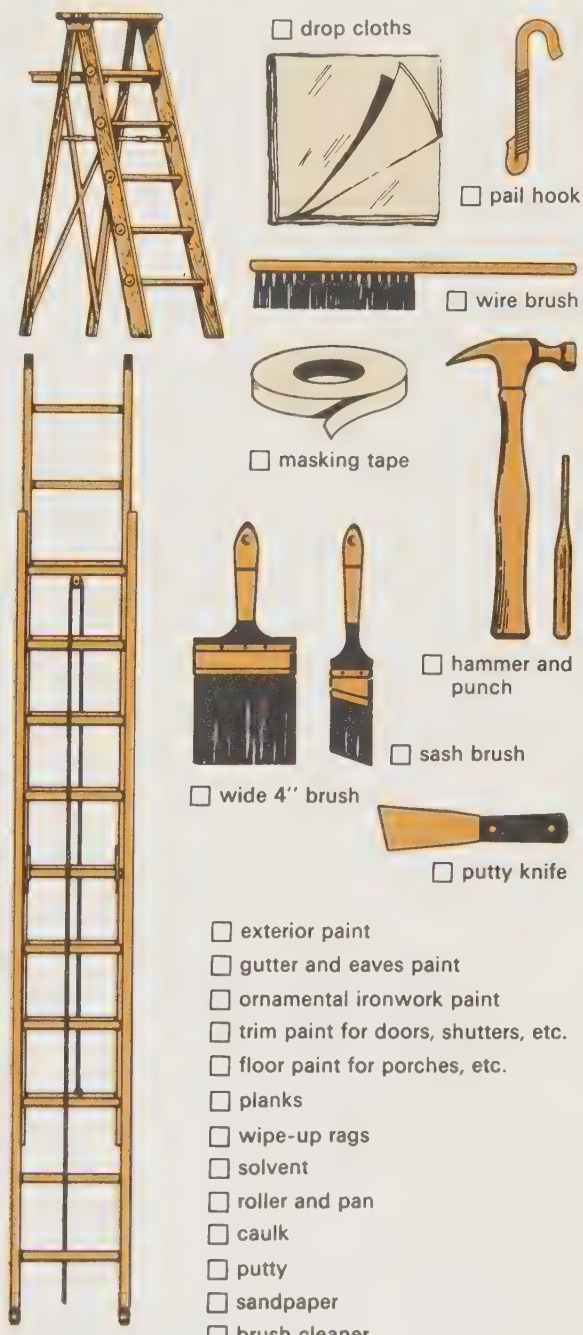
If the sash is one that has been unpainted

for some years it is likely to be in such condition that mere scraping of local areas won't do the trick, because of the likelihood of trapped moisture beneath the aging paint. Rain beating against the glass flows off swiftly, and finds a way to seep between wood and glass no matter how well it is sealed. This causes unsightly crackling or alligatoring which cannot be concealed by additional coats.

There is a ready answer to this situation available at your paint store. Buy a good grade of paint remover, spread generously on the sash and allow to work for about 15 minutes. If the old finish is still stubborn, apply another coat of the remover before attempting to clean away the already "bubbled" first application. This way, all old coats can usually be removed at one time with brush, putty knife or spatula.

Some removers can be rinsed from the surface by simply hosing down; others require a specific wash. Be sure to follow directions here; any left-over remover may tend to lift your new paint or stain job. Proper drying times should also be followed. For instance, an alcohol wash, though it costs more, dries quickly. On the other hand, a water hose-down, although cheap, may take as long as two days to dry completely enough to enable you to start your painting, especailly in humid weather. A wire brush or a good old-fashioned scrub brush is a good bet for close corners and carved work, where little leftovers of remover tend to settle.

At this point, it is a good idea to replace old putty to stop annoying rattles as well as air leaks that make your home drafty in winter. Caulking around window and door frames should also be done now. Hardware that can be removed temporarily (so that it does not get spattered by brush, spray or roller) can be cleaned of old paint or, if brass, chrome, etc., repolished and lac-



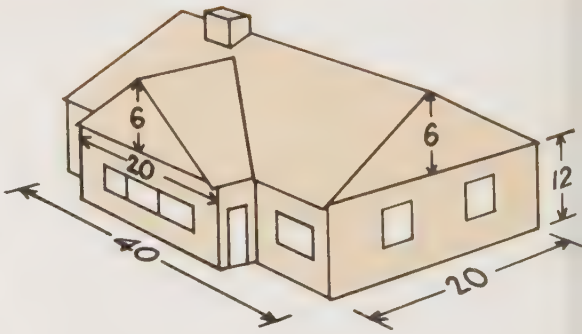
➤ *Use this equipment and materials check list to help plan your job.*

Use These Products For	LATEX HOUSE PAINT	GLOSS HOUSE PAINT	EXTERIOR STAIN	EXTERIOR MASONRY PAINT	OIL BASE FLOOR ENAMEL	LATEX FLOOR ENAMEL	ENAMEL	HI-GLOSS ENAMEL
WOOD SURFACES								
Clapboard	•	•						
Shingles	•		•					
Shakes	•		•					
Rough Lumber	•		•					
Exterior Plywood	•	•	•					
Shutters, Doors & Trim	•	•					•	•
MASONRY SURFACES								
Concrete	•			•				
Cement Block	•			•				
Asbestos Shingle	•			•				
Brick	•			•				
Stucco	•			•				
Asbestos Cement Board	•			•				
METAL SURFACES								
Aluminum Siding	•	•						
Gutters & Downspouts	•	•						
Flashings	•	•						
Railings		•			•		•	•
FLOORS								
Wood					•	•		
Concrete & Stone					•	•		

SAVE TIME AND MONEY

• Read label instructions thoroughly • Prepare the surface properly • Use recommended primers

Here is how to estimate the number of square feet you will need to cover. First estimate the area from the ground to the height of the eaves. To do this add the width and length of the house, multiply this total by the height and double the figure. In the example, 20 plus 40 equals 60. 12 times 60 equals 720. Two times 720 equals 1,440 square feet, the area from the ground to the height of the eaves. To find the area of gables, multiply the vertical distance from eave to peak and multiply the total by half the width of the gable. In the example, six times 10 equals 60 square feet, the area of each of three gables. Three times 60 equals 180 square feet. This is the total gable area. Add gable area to the area to eave height (180 plus 1,440) and the result is 1,620 square feet, the total area that will have to be covered.



quered, then replaced on the newly painted doors and windows.

Protect against spatters. When doing any outside painting, protect your foundation

If the roof of your house is	You can paint the body	...and the trim or shutters and doors															
		Pink	Bright red	Red-orange	Tile red	Cream	Bright yellow	Light green	Dark green	Gray-green	Blue-green	Light blue	Dark blue	Blue-gray	Violet	Brown	White
GRAY	White	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Gray	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
	Cream-yellow		✓		✓		✓		✓	✓							✓
	Pale green				✓		✓		✓	✓							✓
	Dark green	✓				✓	✓	✓									✓
	Putty			✓	✓				✓	✓			✓			✓	
	Dull red	✓				✓		✓						✓			✓
GREEN	White	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Gray					✓	✓	✓									✓
	Cream-yellow		✓		✓			✓	✓	✓						✓	✓
	Pale green			✓	✓		✓		✓								✓
	Dark green	✓		✓		✓	✓	✓									✓
	Beige				✓				✓	✓	✓		✓	✓			
	Brown	✓				✓	✓	✓									✓
	Dull red					✓		✓		✓							✓
RED	White		✓		✓				✓		✓			✓			
	Light Gray		✓		✓				✓								✓
	Cream-yellow		✓		✓						✓		✓	✓			
	Pale green		✓		✓												✓
	Dull red					✓		✓		✓	✓						✓
BROWN	White			✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	
	Buff				✓				✓	✓	✓					✓	
	Pink-beige				✓				✓	✓						✓	✓
	Cream-yellow				✓				✓	✓	✓					✓	
	Pale green								✓	✓						✓	
	Brown			✓		✓	✓										✓
BLUE	White			✓	✓		✓					✓	✓				
	Gray			✓		✓						✓	✓				✓
	Cream-yellow			✓	✓								✓	✓			
	Blue			✓		✓	✓					✓					✓

plantings and nearby shrubbery with drop cloths, as a paint film on leaves and blossoms can keep them from breathing and may cause irreparable damage. Old cloths or even paper, anchored with weights such as stones or bricks, should be placed on paved walks, patios, driveways, etc. Masking of windows with newspaper and mask-

ing tape minimizes clean-up, speeds the work and makes trim painting easier to do.

Where to start. It is not always necessary to paint an entire house at one time. The north side, or that which is exposed to the prevailing wind, is often the first to show signs of deterioration, especially in areas of severe winter weather. Give consideration to the possibility of rotating the job so that a portion of the work can be done at one time, the remainder at another. The complete job can be finished in a single summer season, but with a little time out to make it less of a chore.

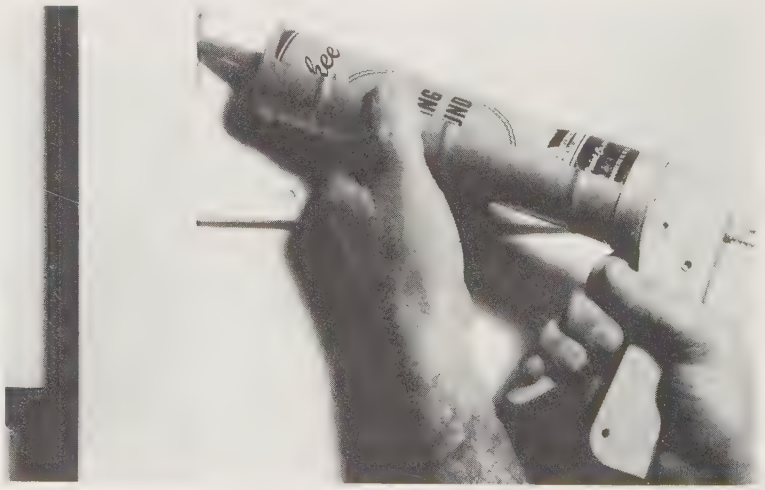
On a complete house painting job it is likely that you may well wonder where to start. Most professionals start at the highest point—at the peak, if you have that type of roof line; in any case, under the eaves. In many instances, a ladder is necessary for this part of the work, and care must be taken for safety's sake. A general rule for using straight ladders: keep a base distance one quarter the length of the ladder. Thus, if your ladder is 12 feet long, it should be three feet from the house foundation. When using a step-ladder, it is bad practice to go higher than the second step from the top.

A wise precaution is to always have a second person on the spot. Never mount a ladder with shoes that are wet with mud, oil or anything that can cause a misstep. Non-skid pads, such as pieces of old innertube, fastened to the tops of the side rails of straight ladders add to the safety factor. Try the first few steps to see if you have a firm foothold below. After taking these precautions, you can proceed with the paint pots with speed and confidence.

When brush painting, the average man can cover a five-foot swath without leaning too far to either side. This means that in the course of doing a 20-foot wall, the ladder has to move only four times. When using one of the new rollers with an extension handle, two moves may well do the trick.

For a neat, clean job, most pros do all the walls and allow a good drying time before doing the trim. Some of the new latex exterior paints dry in half an hour, and it is tempting to see at least one wall completed. However, patience is still a virtue, and in painting it is almost always a must. For instance, although your wall paint seems dry and hard, a spot of dribbled trim white on a beautiful main color may mean another ladder-raising, and an uneven tone, unless the base color has really set. Don't take chances.

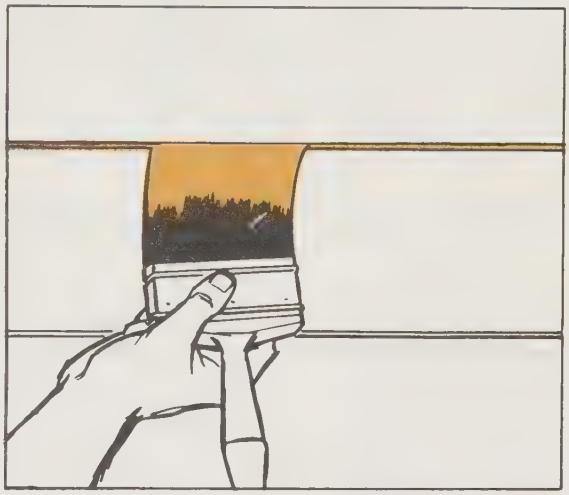
Paint application. The method of paint

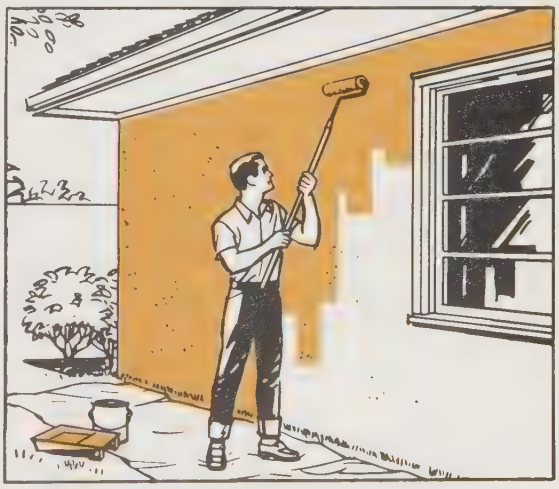


Caulk and make all the necessary repairs before painting.

When filling brush, dip the bristles about one third to one half the way into the paint. Tap the brush gently against the side of the can to knock off excess paint. Do not wipe the brush on the lip.

When painting clapboard siding, paint bottom edge first, then flat side.





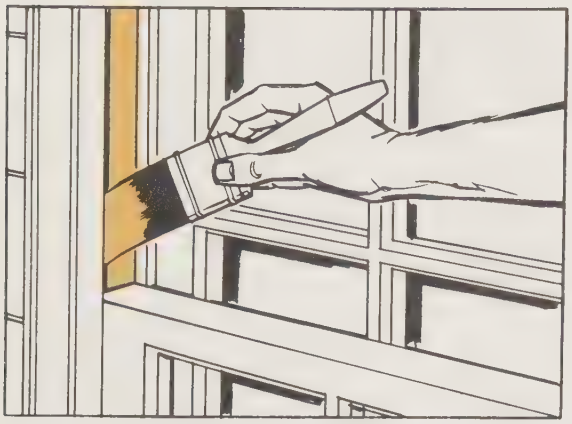
A roller can speed the work on flat surfaces, such as masonry or floors.

application you use for a big job, such as the exterior of your home, is a matter of individual preference. Spraying, when the tank sits on the ground and all you have to carry is the gun, is quick and easy. Here, masking windows, doors, etc. is a must, but don't worry about a little overspray; a trimming knife with an angled blade makes removal a cinch.

To get the under edges of shingles or clapboard, a cut-in roller is ideal. It puts the paint where you want it, instead of letting it dribble away. A follow-up with a long-fibered regular roller completes the job. A seven-inch roller is recommended for clapboard, as it covers the area exposed to the weather after the under edges are done. With the aid of an extension handle, the roller, long familiar for interior work, becomes a most handy tool for outside jobs, often eliminating the need for ladders and such in painting a one-story house garage.

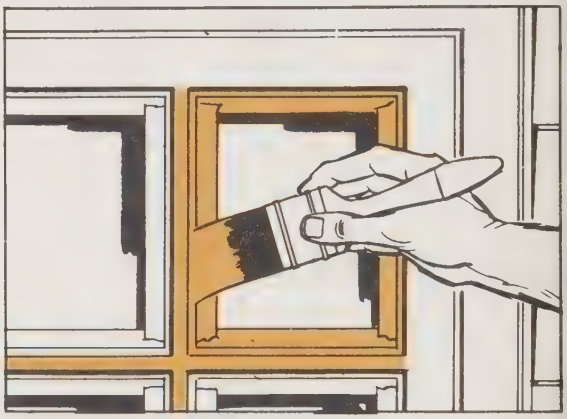
Brushes and rollers are relatively cheap; spray equipment is more costly, although it does a faster job, and when time is a prime consideration, as when doing a whole building in a weekend, or beating threatening weather, it can save the day.

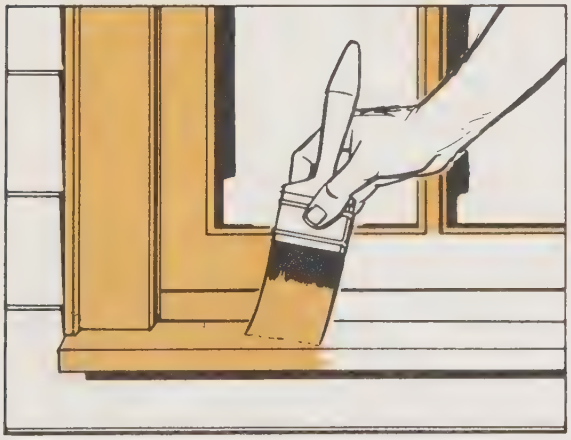
If you do not expect to have too much use for a sprayer, a good bet is a rental. In most areas they rent for about $8 a day with a 2½-gallon container for your paint. Rental services estimate that a one-story house, unless it is unusually large, can be completed (one coat) in one day. Two-story houses, of course, take longer, but still, renting is a good bet unless you plan



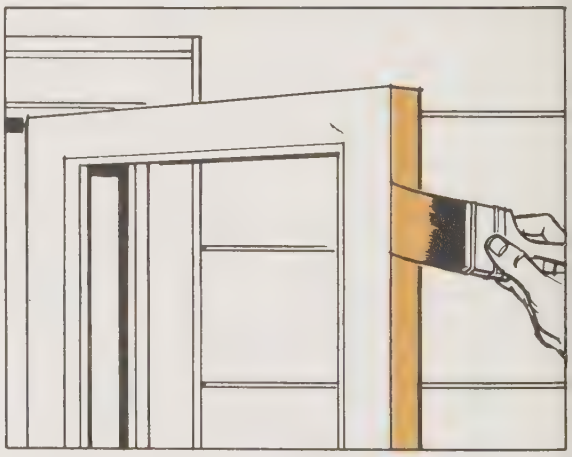
To paint windows, first, sand as necessary, dust and replace loose putty. Then, lower the outside sash, raise inside sash and paint exposed checkrail on each side.

Step two for windows is to paint the cross bars and frames wherever you can reach them with the windows in the same position as in step one. Use masking tape to keep paint off glass. When the upper checkrails are dry, return the windows to their normal position and paint the lower portions of the checkrails and the remaining crossbar and frame areas.





Finish the windows by painting the casing and sill. Leave the windows slightly ajar at top and bottom. Move them up and down several times a day until the paint is thoroughly dry.



Open casement window and paint the top, side and bottom edges first. Next, paint the rails, frames, casing and sill.

extensive use of this type of equipment, as on your boat, car, etc.

No matter what method you employ, the tools you use will serve you in good stead for years and jobs to come, so do take care of them. Most manufacturers tell on their labels what to do: rinse in the appropriate thinner or solvent, and never use an incompatible type, such as turpentine for a shellac brush, or alcohol on a brush used in oil

paint. As mentioned previously, many of the newer types of paint are thinned with water, thus making clean-up a cinch.

Stain, especially the heavy-bodied type, is a happy choice for rough siding and shingles. It penetrates deeply into the pores of the wood; covers, colors and preserves in one coat. A flat, velvety finish, reminiscent of old New England homes and barns, is most pleasing. Many stains are now available in lighter colors than the familiar barn red or deep green. When used with a contrasting trim of sparkling white, they are most attractive.

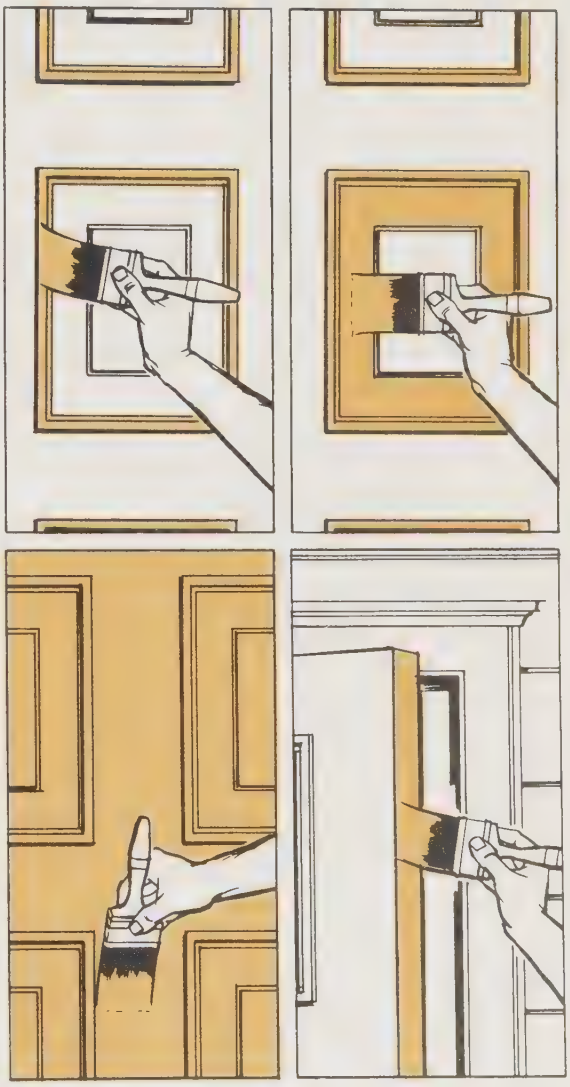
Thinner in consistency than most house paints, stain can be applied with brush, roller or spray gun. When using brush or roller, it is advisable to wear rubber gloves with inverted cuffs to catch runs.

Natural wood finishes. If your home has redwood or cedar siding, and you want to preserve the tone the wood was given by nature, shop around for the type of finish that will not discolor but rather will accent the natural grain, color and characteristics of your basic material. This also applies in some cases where the effect of weathered wood is desirable on a barn or shed used as a studio, where atmosphere is an integral part of the overall effect when used as a backdrop for art works, sculpture or handcrafts.

Special finishes are available for redwood siding which preserve the original tone of the wood. Sometimes people prefer to leave this wood without any finish. In this case, it weathers to a silvery grey, but loses the warm tone usually associated with this rare and wonderful building wood.

On the other hand, if the natural wood used around your house lends itself to a finish (carved or beautifully grained doors, for example), spar varnish is an ideal solution. More flexible than floor varnish, because it does not need the hardeners necessary for resistance to abrasion, it can stretch and shrink with the wood. If you prefer a natural wood finish to paint over large areas, as is sometimes the case in modern houses, here again, spar varnish is a good bet. Ask your paint dealer about varnishes

Begin painting doors by doing the panel moldings first. Then, paint each panel, starting from the top, brushing the paint first across and then up and down. Paint the remaining area and the door edges. If the door swings out, paint the latch edge with exterior paint. If the door swings in, paint the hinge edge.



that have been perfected for boats. They are made to withstand wind and weather.

Trim. The trim around windows and doors may match or contrast with the basic house color. This is, of course, a matter of personal preference. If you have an exceptionally impressive and beautiful front door, accent it by all means. It will add a note of distinction to the appearance of the house. If you have an unattractive but useful louver tucked under an eave or in a corner, the unit may be painted or stained to match the main color; this way it will hardly be noticed from outside.

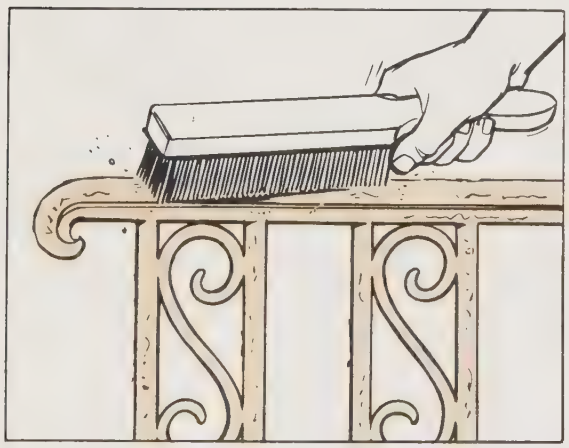
When doing the trim, use brushes or rollers sized and shaped for the job at hand. Trying to do muntins and mullions with a brush designed to paint siding is frustrating and wasteful of time, temper and paint, and is almost certain to ruin the brush as you attempt to flex it in and out of tight spots. A small investment in the right tool will pay off handsomely in a good job, and, properly cleaned and stored, the brush or roller will give years of service.

For porch columns, a pipe painter is very handy. Comprising five sections on a spring that makes it possible to do half of a post in one pass, it saves time and effort. It literally wraps itself around posts, pipes and other hard-to-do items. As the handles on these rollers are adjustable to almost any position, even hard-to-reach spots, such as the back of a post close to a wall, can be done with ease.

Roofing paint. For most modern roofing, aluminum is one of the most popular paints —sometimes in a formula of asphalt aluminum, sometimes an alkyd-base aluminum paint that may be had in white and soft pastels. The reflective properties of the aluminum flakes can keep the interior of your home as much as 15° cooler in summer and reduce heat loss in winter.

The asphalt aluminum used on built-up roll roofing can be spread by roller or long-handled brush. The alkyd type, usually containing asbestos fibers, is best applied with a brush. It seals the edges of asphalt shingles against wind and water. Both types seal pinholes and surface cracks, preventing leaks. The shinier the finish, the more reflective effect. Select your paint according to the result you desire.

The foundation. The exposed foundation walls may be painted to match or contrast with the side walls. If you are painting the



▲ *Scrape or wire-brush away any loosened paint, rust or other material before painting railings or other iron work.*

➤ *Give the work a coat of rust preventive primer, and finish with exterior paint. Do the interior and undersurfaces first, the top and exterior surfaces last.*

It is best to remove items you do not want spattered with paint, such as the globes on ornamental iron work.

house with one of the new latex or vinyl paints, chances are you can use the same material on all the surfaces, be they wood, brick, masonry block or poured concrete.

If the masonry has been previously painted, brush off all loose, powdery paint. Glossy coatings should be dulled by sanding so that the new paint will bond firmly. Fill all holes and cracks for a smooth appearance. If the paint you select is a vinyl, be sure the temperature is at least 50° F. Brushes or rollers can be cleaned with soap and water, stored to use another day.

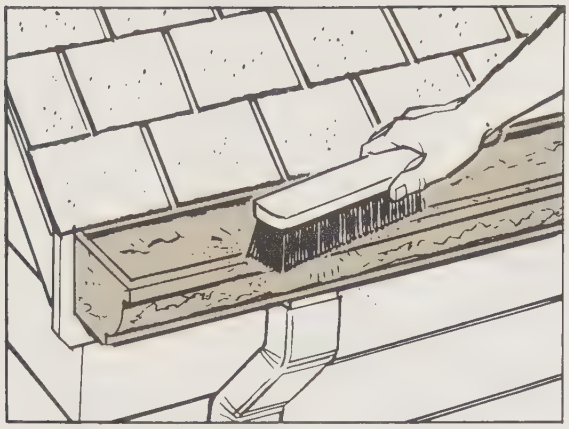
Shutters. If your home has shutters, be sure to remove them so that the areas behind can be painted easily. Even if you plan to do them in the same color as the walls, don't attempt to swing them out of the way, as a really complete job cannot be done this way. Moreover, if this maneuver is tackled from a ladder, it can be extremely dangerous.

For good coverage on the classic louvered types, lay the shutters across two sawhorses on the ground. A good idea is to do all of them on one side, then go back to the first one, flip it over for the second side, and so on. Working in this order, you will minimize the possibility of missed areas and wind up with a crisp, clean job. This is especially important if you use a contrasting accent color.

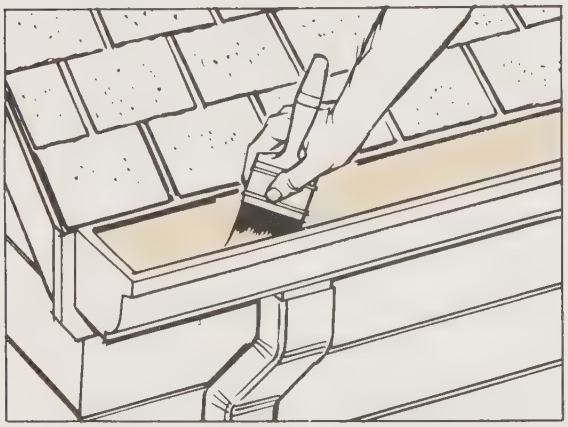
Doorways. As mentioned earlier, if you have a handsome front door, accent it by all means. But, if, after you have finished the whole job and your particular doorway looks unimpressive (in most cases of this kind, presenting a narrow, skimpy appearance, instead of a wide, welcoming entrance to your home), a simple, relatively inexpensive panacea is to buy a pair of full-length shutters and mount them beside the doorway. When they are the louvered type, the horizontal lines carry the eye outward, and give the impression of a wide, gracious entrance.

Another problem may be your aluminum combination storm and screen doors and windows. Although a great boon in draftproofing the house, they may not be compatible in appearance with the style of the building. In some parts of the country, especially near the shore, they may also become pitted from exposure to salt air. In these instances, use the proper primer, and paint for the effect you want just as if they were wood.

Exterior fixtures. Usually made of metal,



Before painting the gutters, remove leaves and other debris and clean the gutters with a wire brush.



Coat the inside of the gutters generously with an asphaltum paint.

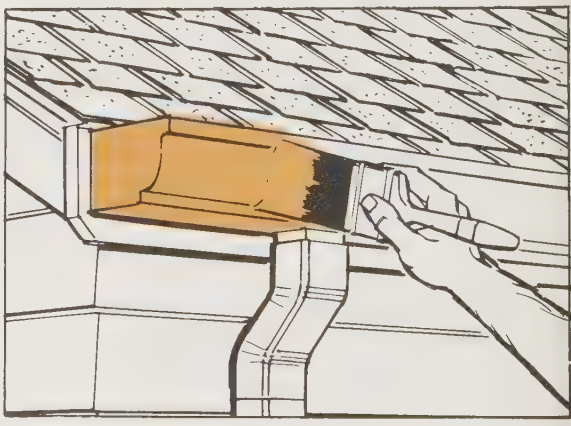
fixtures such as porch or entry lighting equipment need attention, too. And loose, scaling old finish or rust should be wire-brushed and sanded. A good prime coat is a must for proper paint adhesion. Any good exterior paint in the color of your choice can be used over this base. If your house is painted in a light color, black will accent the form of the fixture. If, on the other hand, your house is a fairly dark tone, such as New England barn red or green, snowy white is most effective.

Railings. Nothing is more attractive than a wrought-iron railing beside your steps—and it's an important safety factor in icy weather as well. If taken care of regularly, such a railing will stay beautiful for years.

With modern products, wrought-iron railings can be any color of the spectrum. Where a stairway is poorly lighted, fluorescent paint can spare you many a stumble, not to mention broken bones.

Wooden railings, found on many a comfortable porch, may be painted with regular house paint, provided it is not the chalking type. Kids love to sit on them on a summer night, and this type could be ruinous to clothes. The best bet here is to use a hard paint such as trim. Keep this in mind too, when painting porch posts and columns.

Porches. A porch can be a blessing or a curse, depending on how you paint it. If the ceiling is finished with glossy enamel in a light color, such as a sunny yellow or white, it will reflect light into the rooms behind it, while still providing shade in hot summer weather. If excessive heat from the sun is a problem in your part of the country, a cool blue will reduce glare and provide a light, airy atmosphere to the interior. If, however, you are located in the colder regions, where sunlight is not a problem but rather something to be desired, a warm



Give metal gutters and downspouts a coat of suitable primer, finish with exterior paint.

Taking a chance. Shutters can be painted while they are on the house, but the job is easier if you remove them, and you don't risk spattering trim color over your house's new coat of paint.

When painting porches or patios, start with the railings.

orange-red tone on the ceiling will provide a glow on the grayest of wintry days.

Downspouts and gutters. If you have wooden gutters on your home, treat them to the best of care. They can appear as lovely as a fascia board, and will last for years. Usually made of cedar or cypress, they are similar to the woods used in fine boats. A superior paint for these is, as you might expect, a product made for boats.

After cleaning out any dried leaves and twigs from gutters, allow to dry thoroughly. The leaves removed may seem crackly dry, but there is always a chance of residual moisture in the wood. To prevent more leaves and debris from landing in the cleaned gutters, a strip of screening laid along the length will be a great aid, during the drying period. When the wood is dry, lightly sand, wipe out the sanding dust and you are ready to paint.

An excellent product for this is a two-part epoxy that flows smoothly and gives an exceptionally high gloss. This is an advantage as further accumulations of leaves and debris can readily be removed.

If you have gutters and downspouts of galvanized metal or aluminum, time will take its toll. Aluminum is in a broad sense impervious to the weather, as are the aluminum paints. The galvanized gutters and downspouts most of us are familiar with, however, deserve care. They will stand up under adverse conditions and last for years. They can be painted to match, or contrast with, the siding, as you desire. If a downspout is near a porch post, paint it the same color as the post: if it seems to you an eyesore, color it the same as the background. Let your artistic self dictate here.

Fences. Many of us have our property fenced to protect small-fry from wandering into heavily trafficked roads, or merely to indicate the boundary lines or to set off a garden. Painting a fence need no longer be the chore Tom Sawyer found himself stuck with. Free-flowing, fast-drying paints of today take much of the laborious work out of this most necessary job. Instead of tedious brush-work on close pickets, spray equipment makes it a breeze. Cheap plastic dropcloths to protect lawn and flowers are a must, but there is a bonus here: re-use them in the fall and winter to protect the same shrubs from cold winds and ice storms.

With a spray-gun you can paint almost completely around the pickets. Another pass from the opposite side of the fence will finish the job. If you find a few missed spots later, a quick brush touch-up is all that is needed.

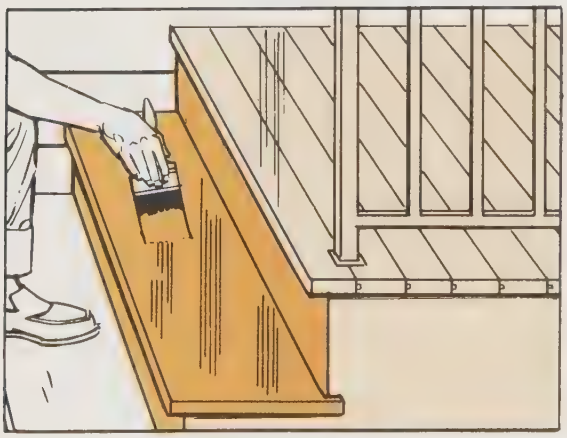
A pipe roller is another labor saving device for this kind of job. Since the roller flexes on springs to wrap itself around the palings, it is almost impossible to miss any area of the fence. Also, here you have no overspray problem—a minor drip or two can do no serious harm to lawn or garden.

General tips for exterior painting. Learn how to make your house blend with your neighbor's, while still following your own ideas of color, etc. A harmonious appearance all along the street where you live makes for happy living.

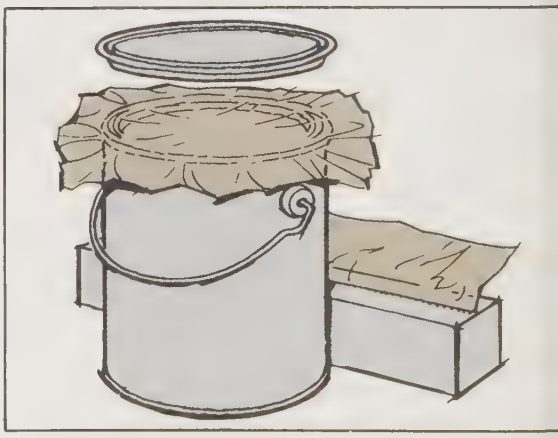
When there is a sale of house paint, and one homeowner does not see how he can take advantage of it because it would entail a larger purchase than he can use on his home, often a community get-together will ante up the money for a fresh paint job all along the road. This kind of overall planning and cooperation can transform a small street of similar houses into an impressive vista, even adding to the resale value if you have to move.

When painting large areas, plan to stop work for the day at a doorway, window or, if possible, a corner if you cannot finish the entire section. This prevents laps from showing. Fortunately, modern paints seldom present much of a problem on this score. G.D.

See also: CAULKING; FLOORS; LADDERS; PAINT; PAINTING; PAINT SPRAYERS; ROOFS; SOLVENTS AND STRIPPERS.



Leave porches, steps and patios until last. Paint steps this way: do underside step extension first, then back panel and, finally, the horizontal surface.



To preserve leftover paint, place a sheet of plastic wrap or other light plastic over the opening before replacing the lid. Be sure to pound the lid down tightly.

All about Painting Your Home's Interior

You can brighten up a dull room with a crisp new coat of paint. Here's how to do the job quickly and easily

THE INTERIOR of any home reflects the taste and personality of the owner. Freshly painted walls and crisply contrasting trim help to create the overall effect. As with any painting project, there are a few basic rules.

Never attempt to paint over a wall that is covered with an accumulation of oil or grease from cooking or heating. A clean surface is a must for maximum adhesion of the new paint. A sound practice is to wash walls from the floor up. This method prevents drips of dirty water from streaking the walls with a residue that is difficult to remove.

There are several products on the market which make this pre-paint cleaning easy. Some do not even require a rinse, others do. Read the label and follow directions. Your paint dealer will be glad to help you by recommending the right product for your purpose. After all, his paint needs a good foundation.

When painting rooms, remove any fixtures you can, such as face plates of electrical outlets, chandeliers and the like. This

▲ *Before starting a painting project remove as many things from the room as possible. Heavy furniture can be pushed to the middle of the room to form an island and covered with drop cloths.*

◀ *Use newspapers or drop cloths to protect floors. Mask baseboards, switches, door hardware and any other fixtures that cannot be removed. Remove as many fixtures as possible, such as lights, face plates, etc.*

▲ *Prime bare metal to prevent discoloration or rust from bleeding through and staining the new paint.*

➢ *Wipe off grease and pencil marks, preferably with a liquid spray cleaner.*

▲ *Fill the roller tray one third full of paint.*

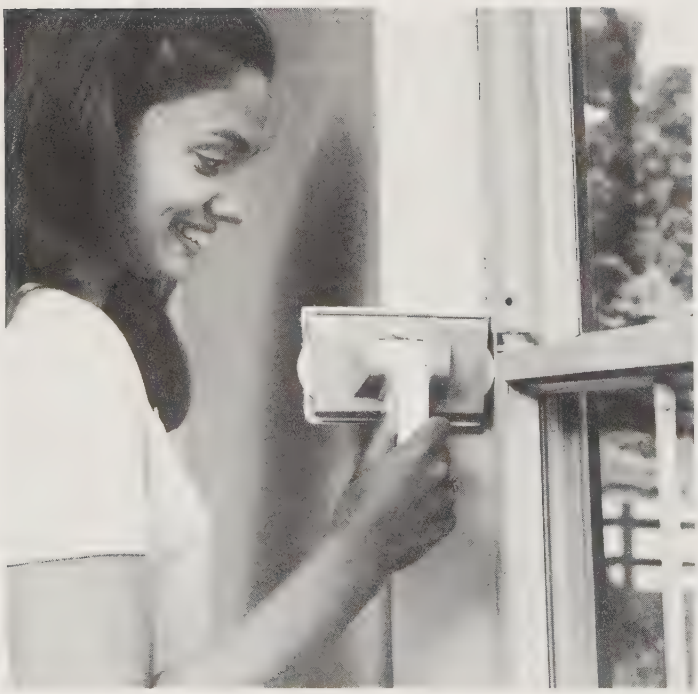
▼ *Wet the roller with water and roll it out on newspapers. Wetting the roller before painting conditions the fibers and eliminates any possible bubbles. It only needs to be done once.*

All about Painting Your Home's Interior *1849*

Paint the ceiling first. Start by applying a strip of paint around the edge next to the walls.

On the ceiling, use roller across its full width for maximum color uniformity.

On walls, apply paint in a W (or an M) pattern, then fill it in.



Pad paint applicator is good for painting edges. Roller on either side serves as guide.

All about Painting Your Home's Interior 1851

Using a pad applicator to paint next to a door frame.

Use a paint shield to protect wall-to-wall carpet while painting baseboard. Be sure to wipe the shield clean each time you move it.

enables you to paint under the plates for maximum coverage, while keeping the fixtures paint free. You might also check on your wiring while you are at it.

Drop cloths. These may be the cheapest you can get. Chances are, if you do a good job all around the house, you won't need these again for many a year. Newspapers, fastened with masking tape, do a good job protecting furniture too bulky to remove from the room being repainted. However, if you have wall-to-wall carpeting, by all means cover it entirely with plastic sheeting because replacing this item would be a costly proposition.

Cracks. Many a beautiful old house or apartment has the original plaster walls, which have, owing to settling over the years, opened minute cracks and fissures. These tend to show up after the walls are washed. This is the time to take care of them, or else your new paint job will be love's labor lost. Widen the crack with a beer-can opener, and fill with spackle. Let spackle dry overnight, then sand lightly and seal if this is recommended for the paint you are to use. For a hurry-up job, patching plaster will speed the work.

Choosing the paint. For living rooms, bedrooms and dining areas, most people prefer a matte finish. Matte finish paints today are mostly water-thinned and dry so fast that the room being redecorated can be in use the same day it is painted. Generally odorless, they are not only easy to apply, but many persons who heretofore disliked painting, and put off the job, now enjoy putting fresh colors into their homes.

Since most interior paints can be applied with brush on roller, according to your choice, a speedy job can be accomplished by teamwork: cutting in with brush can be done by the wife while large areas are rollered by the husband. As cutting in is more tedious, a change half-way is a good idea.

As a rule, no room has all walls without a spot of sunlight, but if your room seems on the gloomy side, paint the wall that catches that patch of sunlight in a light tone, and for a change of pace, use enamel in the same color as the other matte walls. The reflective effect of the gloss will be most rewarding.

The nursery. Here, be sure to use paint that is not toxic. Children like to chew on anything at hand, and to protect them, manufacturers have perfected paints that do not contain lead. Available in a wide color range, these paints are a boon for rooms where small children play. Toys painted with this product can be washed and washed and washed again, so baby can chew away to his heart's content.

The kitchen. A great deal of time is spent in this room, so its colors should be light and gay. If your kitchen is small and cramped, the lighter the color, the better. The overall effect of the light tone will tend to push the walls away, and give you a feeling of spaciousness you never had before. For an easy-to-clean surface on walls and cabinets, enamel is a happy choice. Impervious to most kitchen films from cooking, it may be applied with brush or roller.

If your appliances are in good working condition but look a little shabby, there is a paint to rejuvenate them. It may well be that changing the color to match your new kitchen color scheme will give them a new lease on life, and save you many dollars.

Living areas. Over the years there has been a trend toward designating parts of the home as family rooms, living rooms, dining rooms or areas, based on the various activities indulged therein. The kids may want to set up darts in one place, parents may want to enjoy a quiet game of bridge over a leisurely cup of coffee. The background for these various activities is an important factor.

You can transform a room that has become boring by varying the texture as you paint. There are several ways to do this.

One is to use a sand paint. These paints are heavy bodied, and actually contain sand in the mix. Frequent stirring is advised so that the sand remains evenly distributed. When used over an old wall that has lots of small cracks in the plaster, or over badly taped seams in wallboard, it conceals these imperfections so well that it is almost as if the old wall had been replaced—but at a fraction of replacement cost.

Another trick for texturing is to apply the regular wall paint in a slightly heavier coat than usual, then use a sponge or stippling brush to achieve the effect you want. You can even use a wad of crumpled wrapping paper (don't use newspaper, as a water-thinned paint could allow the print to run and ruin the work). Apply light pressure, and with a slight twist of the wrist as you raise the wad, an almost flower-like pattern is achieved.

The texture from the sand paint is there to stay. Even after many successive paint jobs, you still have the effect. One advantage of the paper-wad or sponge method is that the texture is achieved with paint only, and if you desire to have a smooth wall when redecorating at a later time, sanding can remove the paint deposit in short order. If you are in doubt about how texturing will go with your type of decor, use the sponge or paper-wad method.

Fun with trim. For years and years, trim was always white or a match to the wall color. Many people have become so accustomed to this general scheme of things, they don't realize the effects that can be achieved by giving trimwork a decorative treatment. Sometimes the simple change from the matte finish on the walls to a high gloss on trim can transform a room, give it sparkle and life.

Doors. When you have paneled doors, they can often provide an accent if the panels are finished in a glossy paint and the rails flat, or vice versa. Many decorators advocate the use of contrasting colors for this type of door. The panels can be done in a color that picks out a flower tone from drapery or upholstery fabric, or if you want to add a really distinctive note, glue panels of fabric to the door, seal with clear lacquer and use solid color around the rim. G.D.

When paint is dry, check for spots you may have missed and touch-up with a brush.

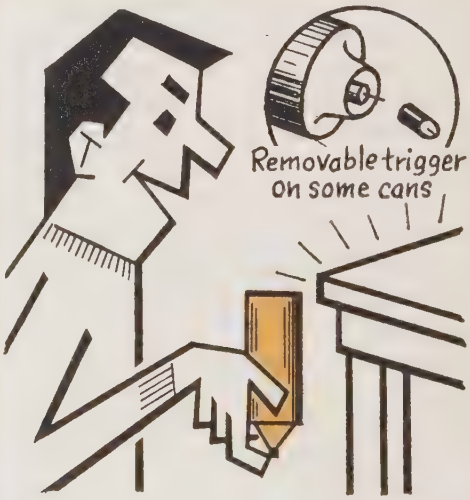
See also: DOORS; LADDERS; PAINT; PAINTING; PATCHING; WALL COVERINGS.

Spray Painting with an Aerosol Can

A lot of painting is done with aerosol cans these days. Follow these tips to obtain the best results from your spray-can painting jobs. Before starting a job, spray a test pattern on a piece of cardboard to determine the distance at which the paint covers best.

Proceed with the painting job by working from the top down and from left to right, taking care to maintain a uniform distance from the work at all times. Continue spraying to—and slightly beyond—the end of the work, then release button to stop the paint.

On each succeeding "pass" (on flat work), the spray pattern should overlap the painted area preceding it by about one-third. Also take care to keep the can parallel to the work; by tilting it at an angle while spraying, you'll cause the paint to bead and run.



When finished with the job, turn the can upside down and press the button a few times to free the feeder tube and valve. Some cans have a removable trigger permitting access to the mechanism so that it can be cleaned with thinner or solvent to prevent clogging.

paint spraying: see repairs, automobile
panel doors: see drawers
paneling: see garage remodeling
panel molding: see moldings